THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXII. No. 1592.] LONDON, NOVEMBER 14, 1893. [45TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.

THOMAS ALLAN & SONS,

Bon Lea Foundry,

SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF

SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

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—ESTABLISHED 1830.—

PARKER & LESTER,

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Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

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Special Quotations to Gas Companies.

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Lanemark Coal Co.,

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LANEMARK CANNEL

AND GAS COALS.

Quotations and Analysis on application to

LANEMARK COLLIERY,

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Shipping Ports: All the principal Scotch Ports.

THE "C" BURNER.

NEW HIGH-POWER GAS-LIGHT.

INCANDESCENT GAS-LIGHT SYSTEM.

Consumes

3¾ cubic feet per hour.

Gives a light of

70 to 80 candle power.

Brilliant Light.

Perfectly Steady and

Noiseless.

Smokeless.

Reduced Heat.

The Ordinary Burner, with Special Globes, is suitable for Lighting Private Houses, Public Houses, Restaurants, Shops, &c.

Special Lamps constructed for Outside Lighting and Street Lighting; and Large Clusters of Lights made for Lighting Halls and large Areas from one centre.

Can be attached to any Gas-Fittings.

THE TRIUMPH OF GAS OVER ELECTRIC LIGHT.

Taking Gas at 3s. per 1000 cubic feet and Electric Light at 8d. per Board of Trade unit, the "C" Burner will produce an equal amount of light at **One-eighth the cost of Electric Light.** This cannot be disproved.

Substantial and Pushing Sole Agents wanted in each Town using Gas.

For Terms and Particulars, apply to the Manager of

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Near St. James's Park Station.

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IMPROVED WET GAS-METERS IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

IMPROVED DRY GAS-METERS.

Speciality: PATENT CASH PREPAYMENT METERS.

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Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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A Four-Lift Gasholder, nearly 200 feet high and 8 million cubic feet capacity, has been recently erected by us for The Gaslight and Coke Company, London.

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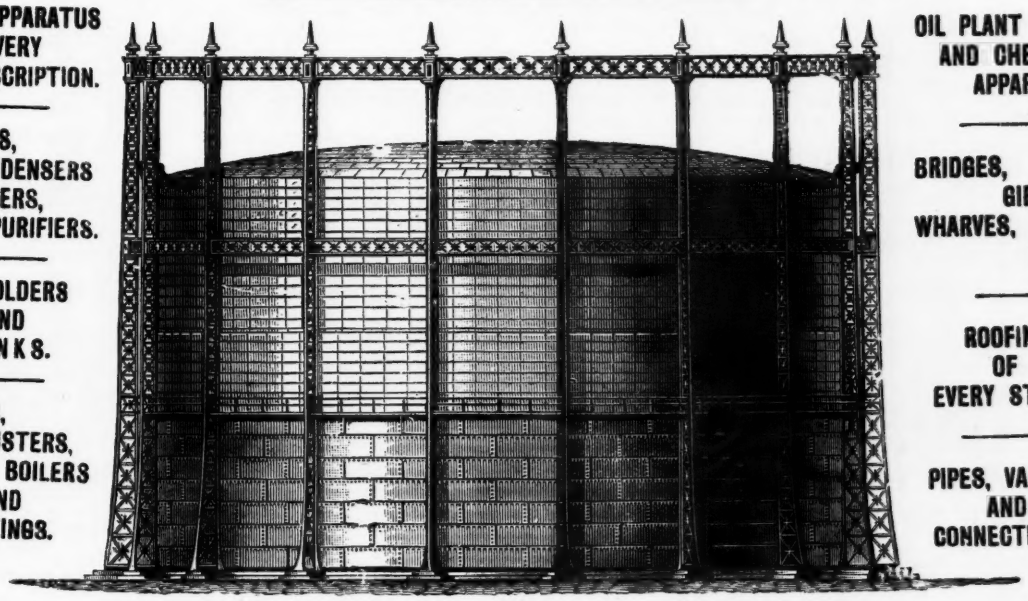

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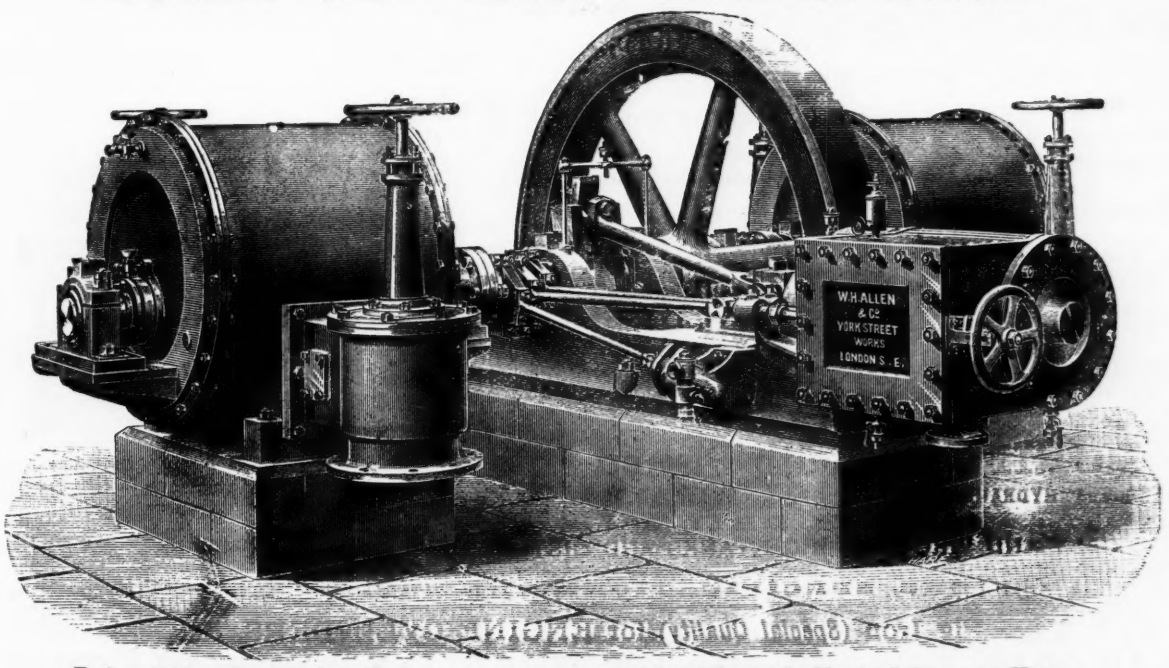

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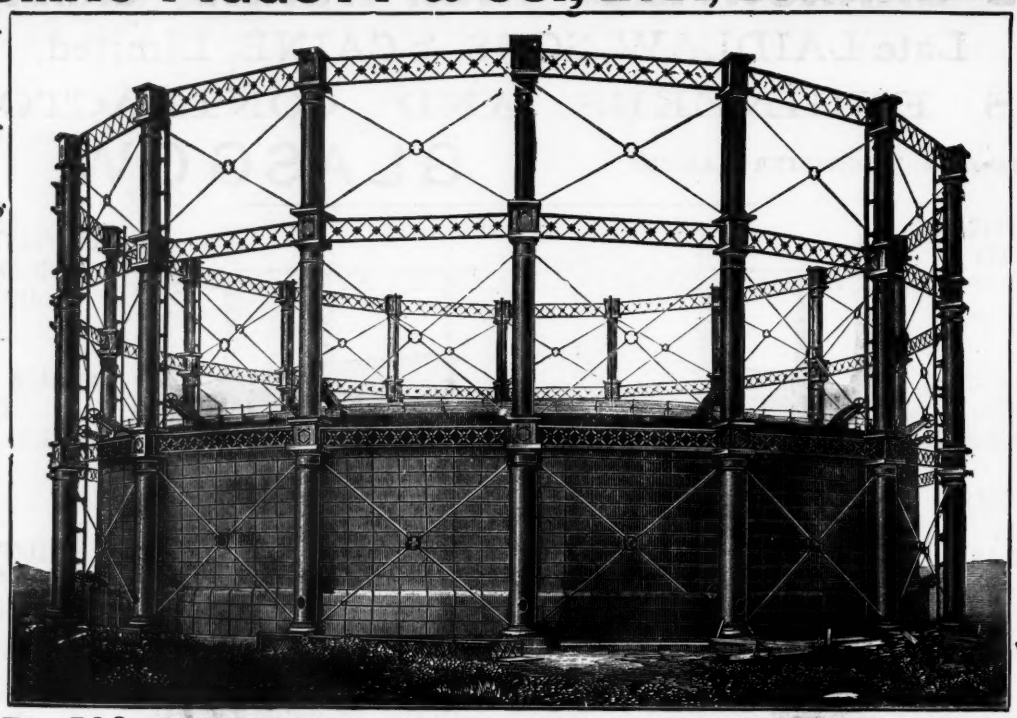

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Address THE STRAFFORD COLLIERIES COMPANY,

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AND
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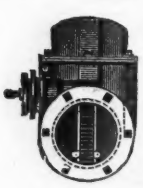

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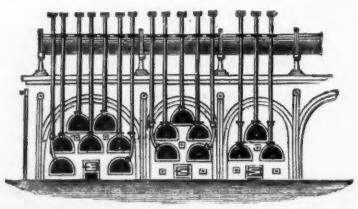
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.



WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c,

PATENT
CENTRE-VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,
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WOOD GRIDS.
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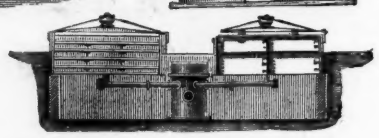

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GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

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furnish Plans, Estimates, and Specifications for SINKING BOREHOLES *and* WELLS; *Erecting* RESERVOIRS, FILTER-BEDS, *and* GASHOLDER TANKS; *and* EVERY REQUISITE *for* GAS *and* WATER WORKS,
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L. W. LEEDS' PATENT
FLOOR-WARMING GAS-STOVES.

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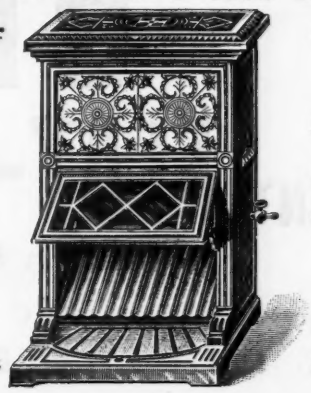

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Wrought-Iron
TUBES
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LAMBERT BROS., WALSALL,
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BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Short Street, LAMBETH.

HUTCHINSON BROTHERS,
GAS ENGINEERS, &c.,
MANUFACTURERS OF

Improved Wet & Dry Gas-Meters.
STATION-METERS. LAMP-METERS.
Test Gasholders and General Gas Apparatus.
Brass Main & Lamp Taps. Unions, Ferrules, &c.
The "Falcon" Lamplighter's Torch. Service Cleansers.
SYPHON AND OTHER PUMPS.
WOOD AND WROUGHT-IRON PURIFIER-GRIDS. SCRUBBER BOARDS.
WET AND DRY METERS REPAIRED.
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Telegrams: "HUTCHINSON BROS., BARNSLEY."

WENHAM LAMPS
With Recent Improvements.

PRICES
FROM
STILL THE BEST REGENERATIVE LAMP.
20/-
CHEAPEST! MOST ORNAMENTAL AND RELIABLE!

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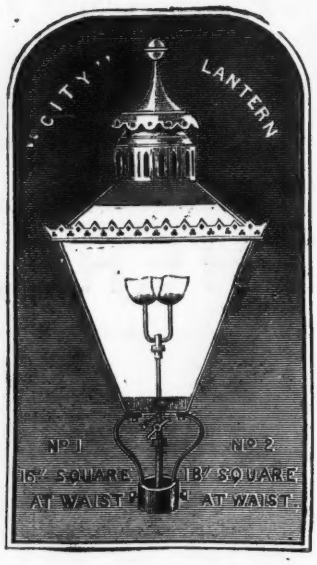
THE WENHAM COMPANY, LTD. UPPER OGLE STREET, LONDON, W.

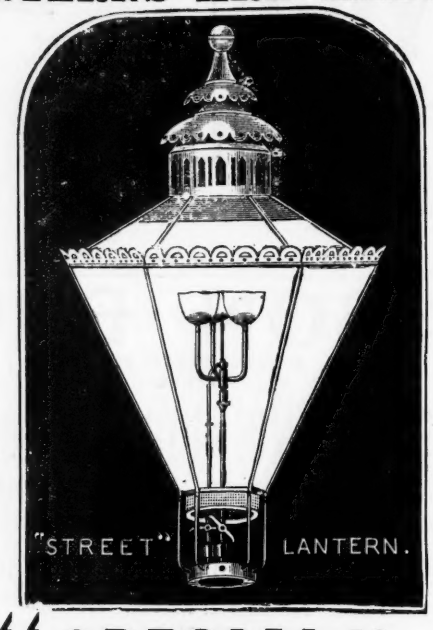
SEND FOR PRICE LISTS
OF
BRAY'S
PATENT FLAT-FLAME LANTERNS.

From 30 to 1100 Candle Power.

They are suitable for Gas of every Candle Power.

ALL OUR LANTERNS ARE MADE OF COPPER.



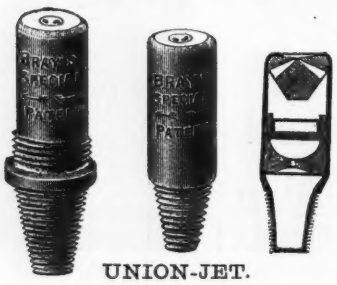


BRAY'S "SPECIAL" BURNERS

Are the best in the Market for general use, and are very moderate in price.

It is not unusual to see the ordinary Burner yielding less than half the light that Bray's "SPECIAL" would yield with the same consumption of Gas.

Gas Managers should try them on consumers' fittings; and they would see at once how to compete more effectively with the Electric Light.



UNION-JET.

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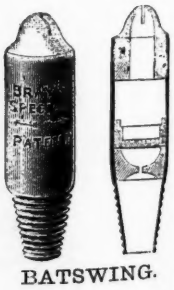


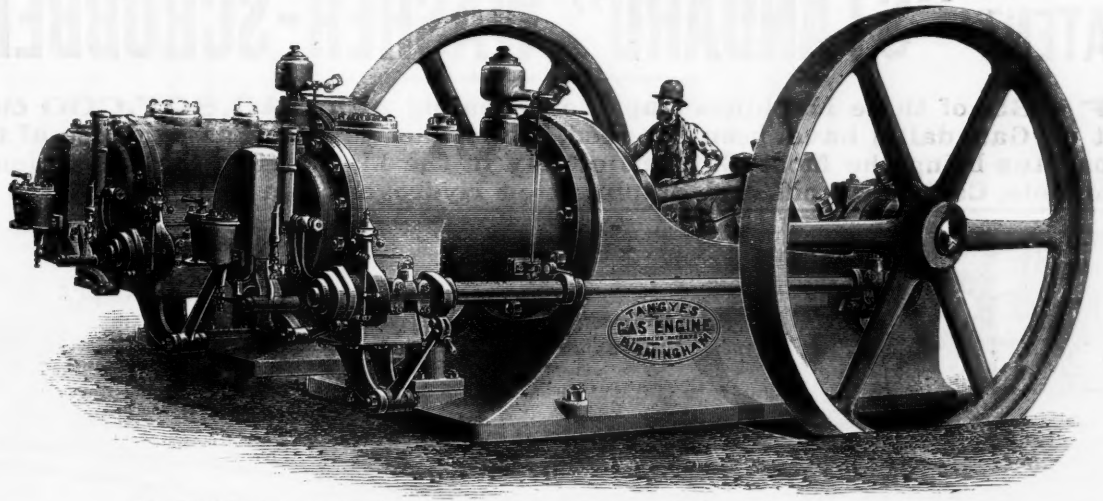
BATSWING.

GEO. BRAY & CO., GAS LIGHTING ENGINEERS, LEEDS.

TANGYES' GAS-ENGINE

"OTTO" PRINCIPLE. PINKNEY'S PATENTS.

Messrs. Tangye have laid down special Plant and Tools for the manufacture of these Engines, and are able by their system of MULTIPLE MANUFACTURE and of WORKING TO GAUGE to turn them out in the best possible style.



The 70-H.P. (Nom.) Coupled Engine, giving 172 Actual H.P., and indicating 200 H.P.
Single Engines from ¼ to 146 Actual H.P. (=170 Ind. H.P.) and Coupled Engines from 86 to 292 Actual H.P. (=340 Ind. H.P.)

APPLY FOR ILLUSTRATED AND DESCRIPTIVE CATALOGUE OF GAS-ENGINES TO

TANGYES LIMITED, BIRMINGHAM.

ALSO AT

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SAML. CUTLER & SONS, MILLWALL, LONDON.

NEARLY

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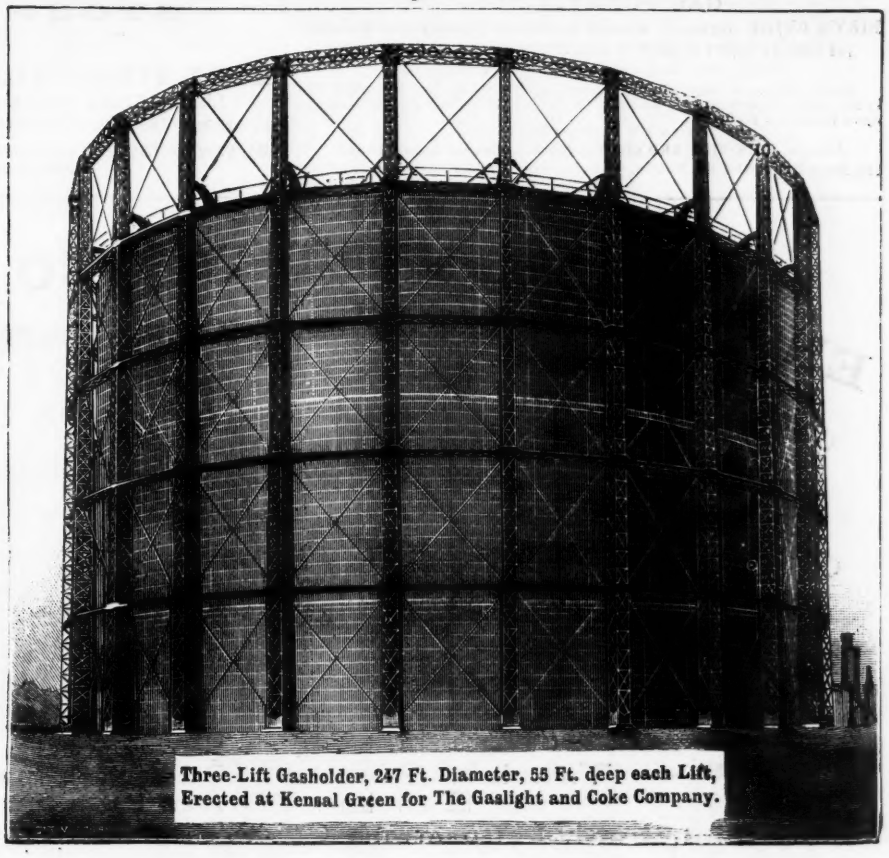
CUBIC FEET

CAPACITY.



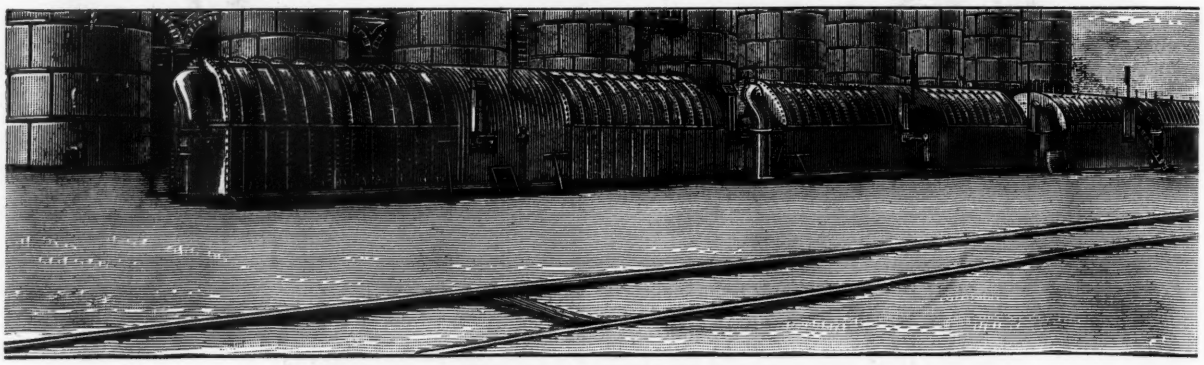
Three-Lift Gasholder, 247 Ft. Diameter, 55 Ft. deep each Lift, Erected at Kensal Green for The Gaslight and Coke Company.

KIRKHAM, HULETT, & CHANDLER, LD.,

Patentees of the

PATENT "STANDARD" WASHER-SCRUBBER.

☞ **465 of these Machines (capable of dealing with 440,807,000 cubic feet of Gas daily) have been supplied, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.**



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company has **27** of these Machines in use; and they are also in operation at a great number of Gas and other Works in this Country and abroad.

Address : 3 & 4, Palace Chambers, Bridge St., Westminster, S.W.

IRISH OXIDE OF IRON.

GAS PURIFICATION.

RIKY'S OXIDE (formerly worked by Messrs. Stanley and Olphert).

THE LARGEST SUPPLY OF OXIDE IN HAND OF ANY OTHER FIRM IN THE WORLD.

Purity and Uniformity of Quality Guaranteed.

RIKY AND CO. can supply the above at a much lower rate than any other firm in the trade, being owners of the property where it is found. *No Middleman* or *Agent* receives a profit.

SAMPLE AND PRICE ON APPLICATION.

Address **JOHN RIKY AND CO.**, Killygordon, County Donegal; and 193, Great Brunswick St., Dublin. Telegrams: "RIKY, KILLYGORDON."

HARPER & MOORES,

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MANUFACTURERS OF

BEST FIRE-BRICKS, GAS-RETORTS,

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Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.

ESTABLISHED 1836.

ENGINEERS, WILLEY & CO., EXETER.

GASHOLDERS,
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CONDENSERS,
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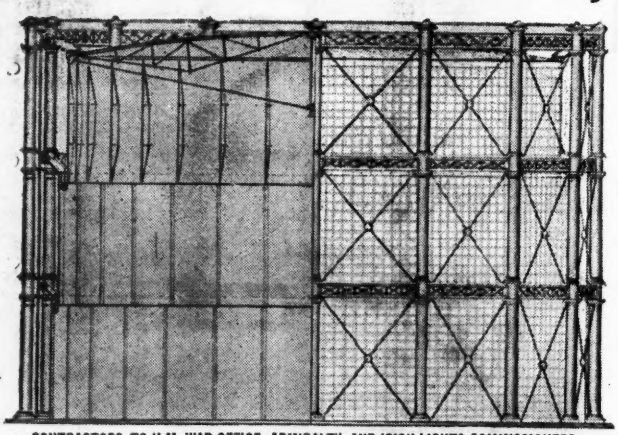
ENGINES, AND
EXHAUSTERS.



LIVESEY WASHERS,
STATION METERS,
STATION GOVERNORS,
IRON & STEEL ROOFS,
WROT & CAST TANKS,
RETORT-FITTINGS.

CONTRACTORS TO H.M. WAR OFFICE, ADMIRALTY, AND IRISH LIGHTS COMMISSIONERS.

THREE-LIFT GASHOLDER, 124 FEET DIAMETER.
EACH LIFT 28 FEET DEEP.
ERECTED AT THE GAS-WORKS, PLYMOUTH.

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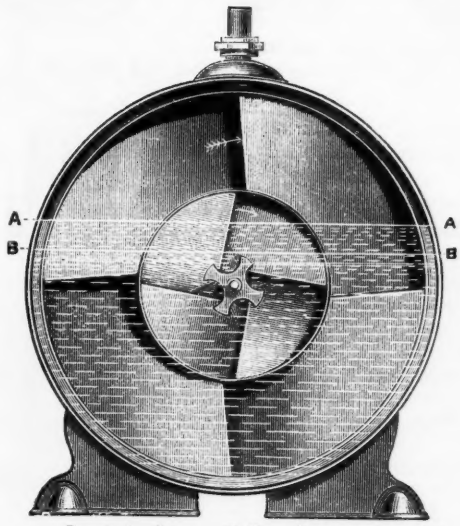
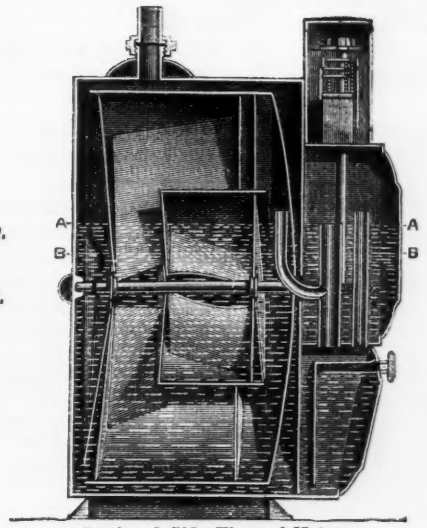
THE WARNER AND COWAN METER.



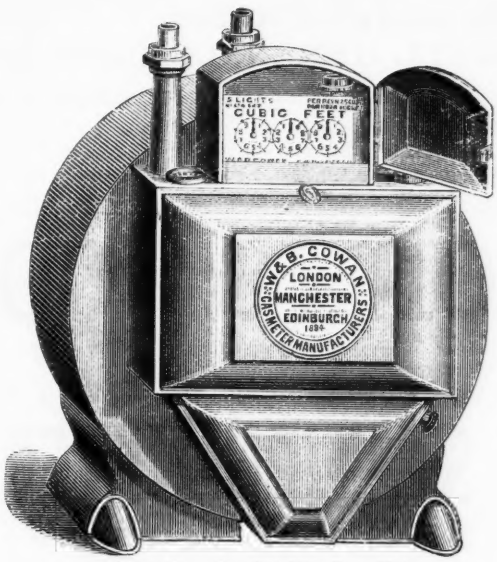
A A, High-Water Line.

B B, Low-Water Line.

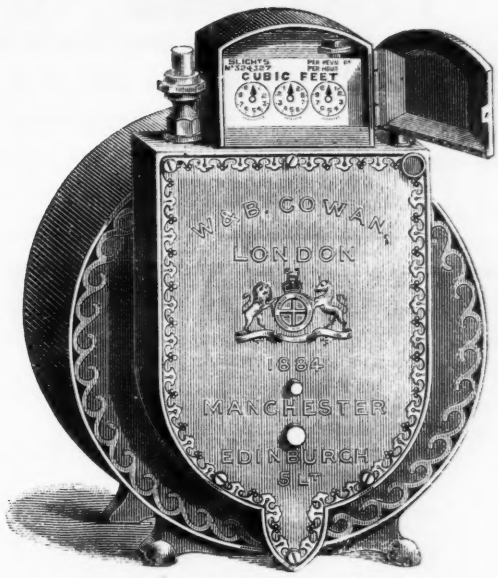
Drum in Case. Hollow Cover removed.



Sectional Side View of Meter.



Elevation showing Tin Case Meter.



Elevation showing Cast-Iron Case Meter.

In its completeness as a measure, the WARNER AND COWAN drum differs from every other. Of definite capacity, irrespective of the water-line, it can neither be over nor under filled, but discharges at each revolution the same volume of gas.

It is to this also that its secondary, though important, advantage is due—viz., the long float-range which this drum permits.

The illustrations show front and side views of the drum, and also views of the complete meter—both in tin and cast-iron case.

The drum being of fixed capacity within itself, the extraneous mechanism and arrangements are of the most simple character. These include all that is necessary, but exclude all that would be superfluous.

W. & B. COWAN,

ESTABLISHED 1827

SMITH SQUARE WORKS, WESTMINSTER, **LONDON, S.W.** TELEPHONE No. 3250.

DUTTON STREET WORKS, **MANCHESTER.** TELEPHONE No. 1545.

BUCCLEUCH STREET WORKS **EDINBURGH.** TELEPHONE No. 753.

TELEGRAPHIC ADDRESSES:

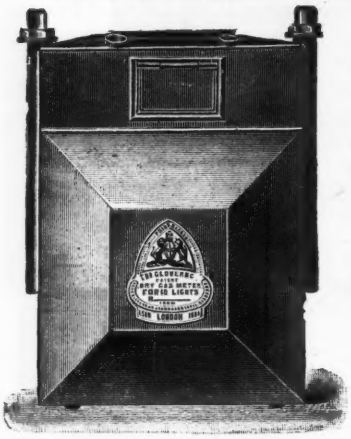
"DISC LONDON." "DISC MANCHESTER." "DISC EDINBURGH."

Telegraphic Codes used, A1 and A.B.C. 4th Edition. Special Code furnish on application.

[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;
The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.



1st.—Are a remedy for all the defects of Wet Meters.
2nd.—Are suitable for all Climates, whether hot or cold.
3rd.—Incur no loss of Gas by Evaporation.
4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
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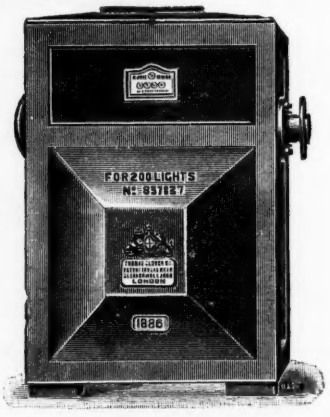

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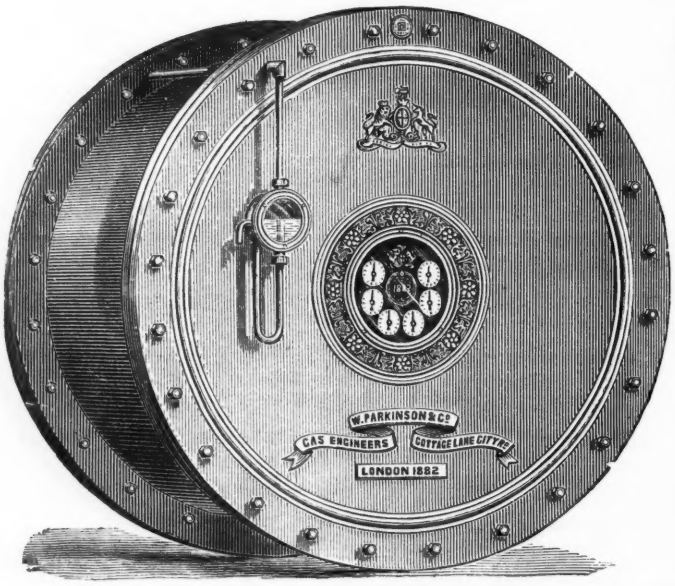

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 14, 1893.

The Employers' Liability Bill.

THE defeat of Mr. M'Laren's amendment to the Employers' Liabilty Bill on Friday night by the narrow majority of 19, was the parliamentary event of the week. The question of "contracting out" was most elaborately debated during the four days devoted by the House of Commons to the consideration of this amendment; and the salvation of the Government was due, so far as argument had anything to do with the issue, to the clever pleading of the Home Secretary, for whom the result of Friday night's vote is a striking personal triumph. It is also an indication of the extent to which professional agitators, such as Mr. John Burns, have succeeded in dazzling the Administration with a false view of their political importance. The vote is a paradox, in a House of Commons constituted as the present one, with a majority of members persuaded as to the validity of the principle of Home Rule—which, divested of its special application to the case of Irish government, surely means giving to definite bodies in the community the right to manage their own affairs. This was precisely the issue raised by Mr. M'Laren, a consistent adherent to this policy, who claimed for his constituents, the servants of the London and North-Western Railway Company, the right of saying how their personal interests in regard to their employment should be protected. The very strong position taken up could not be faced by the advocates of the Government proposal; but both Mr. Asquith and Mr. Burns attempted, with apparent success, to turn it. Mr. Asquith urged that the amount of the compensation allowed to the railway men under their favourite scheme is below the average damages that would be awarded to sufferers by a jury; and that therefore the men would be better off under the new law. Mr. Burns argued that the railway men, numerous as they are, should not be permitted to stand in the way of the conferring of a valuable privilege upon the vastly greater number of workers in other employments. Neither of these arguments appears to us to hold water. It is an answer to Mr. Asquith to point out that though the usual amount of compensation given to injured workmen under accident funds established by mutual action between employers and employed, is less than the damages which a jury might award for cases of proved desert, yet the latter would not number, over any specified period, more than a small proportion of the cases which are now relieved out of such funds without dispute or delay. Surely a man, whether he is a workman or a member of any other class in the community, should be free to elect whether he prefers a "bird in the hand" to the proverbial "two in the bush," especially when the bush is composed of legal horsehair. As for Mr. Burns, it is enough to say of his plea that it is wholly beside the mark. Neither Railway nor Gas Companies' men seek to deprive other workmen of a boon; but they do ask to be treated like responsible beings. As it stands, the vote of the House of Commons is a declaration that, while workmen are intelligent enough to be entrusted with the franchise, they must not be regarded as knowing so well what is good for them in the way of accident insurance, as a miscellaneous assemblage of honourable gentlemen whose own circumstances are different.

The question of "contracting out" is sure to be raised again in the House of Lords; and, meanwhile, pardonable curiosity will be felt as to what will be the course of action of the important industrial and transport corporations, such as the London and North-Western Railway Company and the South Metropolitan Gas Company, in the event of the decision of the House of Commons being allowed to stand. The minutes of the London and North-Western Board, quoted to the House by Mr. Plunket, contain a declaration of opinion on the part of the Board that in the event of the Bill passing in its present shape the contributions of the Company to the accident fund of the undertaking must cease. The Board have been fiercely attacked for having come to this decision, which is intelligible as a businesslike disinclination to give something for nothing, by opponents who, of course, habitually indulge in this disinterested behaviour. We do not believe, however, that any of the Companies concerned in this matter will act in haste, or do anything to play into the hands of their enemies. In the course of his contribution to Friday night's debate, we observe that Mr. John Burns read one of the anonymous letters with which persons of his stamp are usually well provided, accusing the South Metropolitan Gas Company of having coerced their workmen into signing a petition against the Bill. But the honourable member for Battersea must pardon the remark that his credit for absolute truthfulness is not so universally approved as to cover every statement he may make, from the safe standpoint of his place in the House, upon his own or an undisclosed authority. He also had a fling at Mr. George Livesey personally; asking why Mr. Livesey was so anxious for profit-sharing in order to kill Trade Unionism. "He "could not understand why, because Mr. Livesey had "been compelled to comply with the Union terms as to "rates of wages; and the only result of that gentleman's "action had been the spending of £150,000 of the gas "consumers' money, while the Unions were as strong as "ever." The word "not," in the first sentence quoted, seems to have dropped in by mistake. If this sort of

reckless misstatement was what influenced the House of Commons last Friday, it will be permissible to raise once more the familiar form of thanksgiving for the existence of the House of Lords.

The Coal War.

THE most striking and remarkable thing that can be said about the great coal miners' dispute this week is that it is still going on, as stubbornly as ever, and that there is not the faintest indication that the end is nearer to-day than it was two months ago. The men's leaders have taken upon themselves the responsibility of advising the rejection of the employers' proposals, discussed in these columns last week; and their advice has been followed. The incident is an instructive illustration of the inherent weakness of all proposals for the settlement of wages disputes by Arbitration or Conciliation Boards. The recent conference of employers and miners' representatives was, as Mr. A. M. Chambers said of it, to all intents and purposes a Conciliation Board, inasmuch as it was a meeting of both parties to an industrial dispute for the purpose of agreeing to a solution of a quarrel over wages. Theoretically, the matter at issue was a pure bit of business, which a couple of accountants and an umpire might have been deemed competent to settle; being, in appearance, nothing more than a question of what wages could be paid by colliery proprietors to their workpeople in a certain condition of the market. Actually, the men's leaders have elected to complicate the issue by laying claim to what they call a "living wage," as the minimum to be payable by the employers, whatever the state of the market; and the introduction of this irrational quantity into the formula has rendered it insoluble. There is no way out of the difficulty thus created. Conferences are of no avail. Both parties have committed themselves to an appeal to that autocrat whose name is Starvation; and to this dreadful Cæsar they must go. Benevolent people are being strongly urged to soften the conditions for one of the combatant parties by subscribing for the relief of the suffering families of the strikers; but nothing that can be done in this way will avail to keep back the rising tide of misery which even now swamps the sadly idle Black Country. Nobody begs for the people who are dependent in other ways upon the coal-mining industry for their means of livelihood; but the distress is not confined to the mining class. One result of the existing deadlock may be noticed as not altogether without value, as a solid piece of indisputable economic verity among the mists and pretences of opinion. It is that nobody dreams of calling upon Government to determine by force what is seen to be a purely economic problem. A handful of self-advertising politicians of a particular brand have posed as solicitous to advance the cause of the miners; and this attitude will be claimed by them as "showing sympathy" with the suffering workers—and voters—in their distress. But even these ingenious gentlemen have been fain to admit that the trouble will have to be fought out on the lines of all other strikes, until one or the other side gives in. Not all the high-flown talk about the triumph of democracy, or the advance of socialist principles—not even the presence of miners' leaders in the House of Commons—has lifted industrial conflicts out of the old ways in which they have been carried on ever since men began to work for wages. This is a good hard fact to have brought before the world, which will be all the better for the reminder that, when men disagree seriously enough over anything that they hold dear, they will fight one another to the death, just as their forefathers did. The lesson of this reflection is that, while it may be impossible for bystanders to interfere with good effect between the combatants, and that calling one side or the other ugly names is not a hopeful means of obtaining peace, the earliest opportunity presented by the cessation of hostilities should be utilized for preventing their renewal, by removing the cause.

Most New Things are Old Things Forgotten.

IT is really wonderful, when one thinks seriously about it, how little true invention there is in the world, and how much of the newest, smartest work in the arts is merely the warming-up of notions of unknown antiquity. It has been remarked that the idea of the penny-in-the-slot machines was used by the Egyptian priests of Heliopolis for the dispensing of holy water at the temple doors; and after this it would be rather hazardous to say what other "up-to-date" appliance of modern civilization is not a rediscovery of something which was merely forgotten amid the chances and changes of older civilizations. The curious thing about these repetitions of old devices is that they are always truly re-born in some mind which knows absolutely nothing of what records have come down to us from the distant past. It is not the student, habituated to the interpretation of difficult passages in old authors, who discovers, under latter-day conditions, the germ of utility that has survived through ages of entombment in the writings of an ancient chronicler, to be revivified in our day. On the contrary, it is the busy, perhaps narrow-minded and self-centred schemer who hits upon something which he fondly believes to be quite unheard of, simply because no examples of it happen to have come within his purview. The merit is his, of course, if he succeeds in making good and novel use of an old idea; but he is nevertheless prone to abuse those inconsiderate ancients, when he learns at length how they anticipated him. Thus it happens that the reader of some good old writers is not unfrequently amazed at the apparent modernity of some of their matter; while the same student, if he occasionally deigns to glance over some of the scribbling of the most "advanced" sciolists of our time, will be disgusted to see in most of it the repetition of antiquated trash that was known to be inane in the days of the Pharaohs. If anything of ours is new, it is our science, and more especially our rationalization and correlation of the physical sciences. Our most truly modern men are the Joules, Groves, and Darwins—if such names may be used in the plural—whose discoveries, and still more certainly whose methods, do not recall anything that the ancients thought or did. When one proceeds from pure science to the arts and industries, the case is different; and the thoughtful observer is often forced to own that they were mighty and clever men who worked in what to us appears as the dawn of the world.

There is an order of mind—and a very cheap, ordinary kind of mind it is—which is ever and anon declaiming in the newspapers concerning the vast superiority to all others of the age we live in. There is a good deal to be said upon this text; but the peculiarity of these vulgar praisers of the actual is that they always select the wrong things—the accidents rather than the essentials of modern life—for their insensate admiration. Their lucubrations generally run in this wise: "What would old Julius "Cæsar say, if he were alive now and could ride from "London to Edinburgh in eight hours?" It would be more to the point to ask these imbeciles what they would have said, if put back into Cæsar's time and told to reduce Gaul and Britain to order with such means as he had at his disposal. Take gas lighting, again, as an example of modern industrial progress. It is this, and more; for it has been one of the most powerful agencies in the diffusion of knowledge. If we look at the shapes of gas-lamps and lanterns, however, it must be confessed that the only tolerable patterns of these articles in the eye of an artist are servile copies of designs invented centuries ago. We cannot equal, much less surpass, the work of Florentine, Old German, Hindoo, Roman, and Greek lamp makers. When we attempt to be original in this class of work, we produce monstrosities; and it is certain that if an Athenian citizen of the era of Phidias were to be "materialized" among us, and asked to judge, from the common British street lamp-post, of the advance the world has made since his day, he might admire the principle, but would shudder at the barbarism of its embodiment.

Mr. R. Nelson Boyd on the Natural Fuel Supply.

THIS being a time when everybody thinks and talks about coal and coal mining, the paper on the subject read by Mr. R. Nelson Boyd before the Society of Engineers at their last meeting must be described as treating of a topic of supreme actual interest. Mr. Boyd gave a retrospect over the history of coal mining, and showed in an entertaining way how many important machines, inventions, and engineering appliances have been originated in connection with mines. Perhaps the most generally interesting part of Mr. Boyd's very instructive communication is that in which he discusses the problem of the probable duration of the British coal-fields. It is remarked that this question is not by any means a new one, and that it has, indeed, a history and a literature of its own. Mr. Boyd refers to the report of the Royal Commission on the subject, and proves that the assumption of the Commission with regard to the rate

at which the consumption of British coal may be expected to increase, has been very nearly borne out by the output up to last year. At this rate, our coal supply has been calculated to last for 276 years. On the other hand, Mr. Price Williams estimates the duration at a little over 100 years; and Professor Marshall has put it at 125 years. Mr. Boyd observes upon these estimates that they are all more or less leaps in the dark, because the basis of calculation is uncertain. In the first place, the estimate of the available quantity remaining is open to correction, as more coal may be found under the Permian and more recent formations than the Royal Commission allowed for. In any case, it does not mean that at the end of the calculated period the country will be destitute of coal, which will get progressively dearer as the mines are deepened; and greater economy will have to be exercised in the industrial and domestic uses of fuel. It is tolerably certain, as we have frequently argued, that with coal in London at an average price of 40s. a ton, the traditional Englishman's love for his open coal fire would suffer an appreciable cooling down; and close stoves, burning coke, would become increasingly popular. Then, as Mr. Boyd remarks, there is petroleum, which is capable of doing very much that is now effected by coal, both in the factory and in the household. And there is also peat, almost inexhaustible natural stores of which exist, and would be drawn upon if coal were not so much stronger and cheaper a fuel. Altogether, there is no reason for raising the cry of the approaching exhaustion of the world's fuel supplies for a generation or two.

The American Association of Gas Managers at Chicago.

The American Association of Gas Managers met at Chicago the middle of last month, under the presidency of Mr. A. E. Boardman; and, from the reports of the meeting in the technical journals that have come to hand, the gathering appears to have been only a moderate success so far as the attendance was concerned. The meeting was officially notified as extending over three days; but all the business was got through on the first day—eloquent testimony to the superior counter-attractions of the Exhibition. Mr. W. H. Pearson, of Toronto, was elected President for the ensuing year; and the next place of meeting is to be Washington. Seeing that the President-Elect is an English subject, this double choice of the place and the man is an interesting proof of the international amenity that such societies promote, and vindicates the wideness of the title of the Association. In general, when the word American is employed to describe any person or thing, it is understood to mean a citizen or an object appertaining to the United States of America. This is, of course, a narrow and conventional meaning; but it is convenient, because there is no word with the exception of the expressive, although scarcely reverent, term Yankee, which distinguishes the American of the United States from the Canadian or the Central American. To return to the Chicago meeting, the presidential address, the greater portion of which will be found elsewhere, was merciful as to its length, and creditably national in interest. Several useful papers were read; the most important of these being an essay on "Gas-Engines "in the United States," by Mr. F. H. Shelton, who did in this way for gas-engines a similar service to that rendered by him some years ago to the water-gas movement in the States. The paper was expository of the claims of gas-engines in general; and it had an illustrated appendix forming a valuable catalogue of the patterns of gas-engines available for the American market. Mr. Shelton deserves to be ranked as Technical Historiographer in Ordinary to the American Gas Industry; and we freely admit that there is nobody like him on this side of the Atlantic. There is nothing more to be said about the Chicago meeting, beyond recording that the Transactions, so far as they went, were creditable to the Association; and the members who attended seem to have enjoyed themselves under the genial rule of Mr. Boardman. If the idea of holding the meeting in Chicago during the Exhibition year was that the attractions of the great show would ensure a fuller attendance of members than usual, the result must be deemed disappointing; but it was an error that will not be repeated, for obvious reasons. Now that the Exhibition is over, we wonder if American gas managers are as sorry as ever that their industry was not specifically identified with this enterprise.

WATER AND SANITARY AFFAIRS.

The Annual Report of the Local Government Board has just been issued, containing, among the multitudinous subjects which it embraces, an account of the Metropolitan Water Supply for 1892. The remarks on this subject in the main report are founded in part on the particulars given by the Metropolitan Water Examiner (Major-General A. De Courcy Scott), as published *in extenso* in the appendix. Some of the comments have reference to Dr. Frankland's report, noticed in our columns when it appeared in April last in the Annual Summary of the Registrar-General. Another source of information for the Government Department consists in the financial report by Mr. Allen Stoneham, the Auditor appointed under the Metropolis Water Act of 1871. General Scott reports continued revision as to the statistics of supply. The constant diminution in the number of the consumers suggests the idea that the time when the water supply will fall short of the requirements of the population must be considerably more remote than has hitherto been supposed. In 1890, the average population supplied by the Metropolitan Water Companies was given as 5,661,640. In 1891, this became 5,494,956; and now it is only 5,300,265. We are told this year, as we were informed on the previous occasion, that "as these questions are undergoing competent in-"vestigation, the figures given in this report must be "regarded as merely provisional, and subject to correc-"tions more or less considerable when the investigations "referred to have been completed." The questions undergoing this prolonged consideration include the quantity of water pumped; and the calculations on this point are admitted to be difficult. Reductions on former computations have been made, in some cases at a greater rate in the present report than in the one preceding. But the effect is to show that the average supply per head is larger than was previously reckoned. Thus the report for 1890 made the daily quantity 30·93 gallons per head; for 1891, it was 32·09 gallons; and now, for 1892, it is 33·90 gallons. At the same time, the figure for 1890 is raised to 32·49 gallons; and for 1891, to 33·52 gallons. The population, therefore, is better supplied than was reported, despite any mistake as to the total quantity of water pumped. In respect to the number of houses, there is less difficulty in approaching to accuracy, though the "services" are obviously in excess of the houses. The figures from year to year are at least comparable. At each date there is an enlarged increase; the additions during the last three years being respectively 10,787, 11,088, and 11,427. The constant supply at the close of the year included 70 per cent. of the houses.

On the subject of filtration, General Scott reports that the character of the seasons during 1892 was, on the whole, favourable for the operations of the Companies which derive their supplies from the Thames and the Lea. Still he considers it cannot be said that any of the Companies taking a supply from the Thames are yet in a position to deliver at all times water which is sufficiently freed from the influence of the floods. He goes on to observe that the examination of the bacteriological condition of raw and filtered river and well water carried out, "on a necessarily restricted scale," by Dr. Frankland, at the request of the Associated Metropolitan Water Companies, "points to conclusions of the highest interest "and importance." But General Scott contends that the correctness of these conclusions could only be established by widened and prolonged examination. The thorough investigation of the subject, and the devising of methods for utilizing to the best advantage the means of purification which exist, or which might be created, would be, as General Scott observes, "a task of considerable magnitude, "and one requiring laborious research." Whether all this is necessary for practical purposes, however interesting from a scientific point of view, is apparently open to question. We might be content to know that 98 or 99 per cent. of the bacteria in the crude water can be kept out of the supply-pipes; and possibly no more than this would be accomplished after all the elaborate inquiry now proposed had been duly carried out. Dr. Frankland and General Scott are both agreed that the want of additional storeage reservoirs, and in some cases a larger filtering area, is demonstrated by the results already obtained in

the exercise of chemical and bacterial examination. But extensions designed to meet such requirements are coming to pass, as shown by the statements of General Scott respecting the Grand Junction, the West Middlesex, the Southwark and Vauxhall, and the Lambeth Company. Now that the Companies are strengthened in their position, as a result of the report of the Royal Commission, they may be expected to proceed with yet greater spirit in extending their works and improving their appliances. This state of the case is illustrated by the speech of Sir W. H. Wyatt, the Chairman of the West Middlesex Company, at the half-yearly meeting of that body last week, as reported in another part of our columns. The Company are so far encouraged to spend money, that they have made a contract with a sister Water Company for the purchase of a reservoir which will hold 6 million gallons of water; and they are also going to Parliament with a Money Bill to provide for other improvements. On the whole, if Parliament is reasonable, we may look for progress such as will give enlarged satisfaction to General Scott, and probably settle the whole question of the bacteria. With respect to Mr. Stoneham's report, the most striking feature is his comment on the conduct of the City Chamberlain in cancelling the stock which he purchases of the East London Company on behalf of the Corporation. By the method employed, Mr. Stoneham remarks, "the 'capital of the Company will undoubtedly in the course "of time be extinguished." But during the process, the profits will remain to be distributed "amongst the for-"tunate holders of the diminished share capital." This, Mr. Stoneham thinks, was not the intention of Parliament, and very likely it was not; but the incident may perhaps serve to show how easily Parliament can bungle when it meddles with the water question.

Water-Meters for Philadelphia.—The Director of the Department of Public Works of Philadelphia is again advocating the use of water-meters in the city. He proposed to apply meters to the services supplying manufacturing establishments, hotels, sugar refineries, and other large consumers. The special reason for bringing up the matter now is the ordinance recently passed, fixing the rate for such purposes at 30 c. per 1000 gallons. The ordinance does not affect the rates for private families.

Intensities of Lighthouse Lights.—At the second meeting, held last Friday at the Trinity House, of a conference of the General Lighthouse Authorities of the United Kingdom and their Engineers, together with representatives of the Admiralty and Board of Trade, it was decided to publish in the official list of lights the candle power of each light, as determined by the Engineers. By this means mariners will be informed of the relative illuminating powers of all the principal lights on the coast. The members of the conference were Sir Sydney Webb, Deputy-Master of the Trinity House, in the chair; Vice-Admiral Sir George Nares, of the Board of Trade; Captain Wharton, Hydrographer to the Admiralty; Sir R. Ball, Scientific Adviser to the Irish Lighthouse Board; Captain Burne, Elder Brother, and Mr. C. A. Kent, Secretary of the Trinity House; Sheriffs D. B. Hope and R. N. Campbell, of the Northern Lighthouse Commissioners; Messrs. W. Watson and G. B. Thompson, Commissioners of Irish Lights; with Mr. T. Matthews, Mr. D. A. Stevenson, and Mr. W. Douglass, the Engineers of the English, Scotch, and Irish Lighthouse Boards respectively. Mr. E. Price Edwards was Secretary to the conference.

The Coal-Fields in West Sweden.—The first researches for coal in the province of Sconia date, says *Engineering*, from the year 1737, at Vallökra, some six miles away from the town of Helsingborg. In the year 1744, the experimental boring was resumed at Bosarp, not very far distant. Here the undertaking was continued under private initiative until 1796, when it was formed into a Company, which began work at Höganös the following year. For more than twenty years, the Company continued work, until, in the year 1825, it was transformed into the still existing Höganös Coal Company. In addition to coal mining, the Company have also gone in for other industries, in order to make good the natural materials at their disposal, such as earthenware, fire-bricks, &c. The Company employ about 1000 hands. In the year 1760, extensive coal measures were secured by a private firm at Vallökra; and, after a lapse of about a century, work was resumed there—two pits being sunk. In 1866 the Vallökra Coal Company was formed, with a capital of 1,500,000 kr. (about £82,500). The concern subsequently removed to Billesholm, where it is still going on, with good results. The Kropp Company was formed in 1871, and worked for a number of years a pit at Bjuf. A new pit has now, with great trouble, been brought into working order; and the manufacture of fire-bricks has also been taken up on a large scale. The Skromberga Coal and Clay Company is the youngest of the Sconian coal companies. It was formed in 1886, and employs about 500 hands. In addition to these, there are several small mines, which are not of much importance.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 905.)

THE week just closed has been, on the Stock Exchange, to a great extent merely the continuation or counterpart of its predecessor. Business generally was very quiet; and the prevailing tendency was dulness. From time to time, there were some slight fluctuations; but they were rather weak, and were soon over—prices at no period getting a good turn upward. The only class which did well were the gilt-edged securities, which profited by the weakness of the Money Market. Railway stocks in general drooped—our home rails suffering from the persistent endurance of the coal strike; while American were a prey to disquieting rumours. The Foreign Market, too, was agitated; Spanish notably being depressed by recent terrible catastrophes, as well as their little African war. Our own small African war has prospered well enough to help up the Kaffir market. Taking things all round, however, it was not a lively week. The Money Market continues quiet, and is pretty well unchanged. There is nothing to alter the position of things so far as one can see along the financial horizon; but a surprise may crop up at any moment. The Gas Market, like the rest, has been in much the same state as it was a week ago. Business, on the whole, has been quiet; and the tendency for the most part was downwards. The only exceptions to this course were to be found among the debenture and other secured issues, owing to the sustained demand for first-class investments for money. In Gaslights, a moderate amount of business was done in the "A" stock at very steady prices; 224½ being repeatedly marked—a figure which is only ½ below the top quotation. Nearly all the secured issues came in for notice, and satisfactory prices generally were realized; while the "G" 7½ per cent. advanced 2. South Metropolitan issues, which have for some time past been standing very firm, were now easier; and both "A" and "B" receded some points. Commercials were very quiet, and unchanged. Hardly anything was done in the Suburban and Provincial Companies; and the few bargains marked gave no indication of any decided tendency. Among the Continental undertakings, Union and European were firm and quiet; but Imperial had a further relapse, closing weak. Among the rest, none presented any feature to notice, except Melbourne debentures, which advanced a point. Much more business was doing in Water; and again the disposition all round was towards easier prices, while two or three quotations have actually declined.

The daily operations were: On Monday, dealings in Gas were mostly in Gaslight "A" and Imperial Continental—prices not coming out very well; but the quotations remained unchanged. East London Water fell 1. Tuesday was quieter, and prices generally were much about the same; but Gaslight debenture and preference realized high figures. Wednesday's transactions were very limited. Imperial Continental was weak, and fell 4; but Gaslight "G" rose 1. Thursday's dealings were largely in Gaslight secured issues. The only move was a fall of 2 in South Metropolitan "B." Friday's prices were rather easier for almost everything dealt in; but Gas quotations did not vary. Lambeth Water receded 1½; and East London and Grand Junction, 1 each. Saturday was quiet, and rather dull. South Metropolitan "A" and "B" fell 2 each; but Melbourne debentures were 1 higher.

ELECTRIC LIGHTING MEMORANDA.

An Advertising Pamphlet—The Reason Why the Later Central Station Undertakings are being Established by Local Authorities—A Lesson from Grimsby.

NOTICE was taken in this column at the time of the paper read by Mr. Robert Hammond, in his new capacity of Consulting Electrical Engineer, before the Incorporated Association of Municipal and County Engineers at the annual meeting, at West Bromwich. This production was intended to serve for an advertisement, and was a fine specimen of its class. Having received the stamp of acceptance by a technical society, it has in consequence become slightly more respectable than it would have appeared in its naked shape of a mere touting circular; and it is now being used by the energetic individual whose name it bears as a means of recommending himself to members of local authorities supposed to be interested in the subject of electric lighting. The only portion of the contents of the paper which can be said to possess any value as a contribution to the available store of information on the subject, is a series of tables showing the extent to which electric lighting from central stations has been adopted in the United Kingdom; and even these are not to be accepted unquestioningly. Statistics, however, are of little interest in themselves. They can only be fruitful of instruction when employed as bases for inferential argument; but when partisans like Mr. Hammond are allowed to deduce general statements from them they are very apt to

become misleading. For example, Mr. Hammond goes to a place like Grimsby, and throws his figures and deductions at the heads of the local notables, in the hope of persuading them that there is a perfect rage among local authorities everywhere for electric lighting enterprises. The only justification for this view of the position is the statement (which is true enough, so far as it goes) that, "though the bulk of the pioneer work has been done by private enterprise, the newer works are almost all being undertaken by local authorities." The question arises, what is the correct interpretation of this fact?

We regard the circumstances as susceptible of very clear and simple explanation. The alteration in the law of central station electric lighting, which slackened the bonds in which speculators in this line were so tightly bound in 1882, gave an impetus to enterprise, and so enabled several electric lighting companies to be formed for the purpose of working a few of the most desirable localities, particularly in the Metropolis. Outside London, most of the more desirable cities and towns had protected themselves by obtaining statutory permission to do the work themselves; and consequently, with but two or three exceptions, the spurt of electric lighting speculation was confined to London. It was a very transient influence after all, although it was sufficient to move about four millions sterling of capital; for the last of the batch of Metropolitan Companies—the City of London Company—was only launched by dint of a strenuous operation which taxed the strength and repute of the Mansion House to the utmost limit. With this venture, the flow of private capital into electric lighting absolutely dried up; neither Mr. Hammond nor any other promoter of such schemes having since been able to induce the public to subscribe another penny for the starting of further speculations of the kind. There was consequently nothing for electricians interested in central station work to do but fall back upon the local authorities who had Provisional Orders which they had refrained from putting into force until it could be seen which of the different pioneer systems of supply best bore the test of experience in working. One by one these authorities have at length made up their minds to do something in the matter—generally in a very small way; and there is the explanation of the state of things already described.

We mentioned the town of Grimsby just now as one scene of the touting electricians' labours. It is sometimes instructive to look at these small examples, because in their own way they clearly illustrate the same class of effects which operate in larger ventures, but in the latter are more easily concealed under big, cleverly-manipulated totals. Grimsby, like Bradford, fancied electric lighting for its town hall; and it has also discovered that the fancy is a costly one to gratify. It used to cost less than £90 a year to light the Grimsby Town Hall with gas; and to do the work by electricity the Corporation bought a gas-engine and electrical plant at a cost of £2000. They now spend about £35 a year for gas for the engine; and this fact, if taken alone, would serve beautifully to support the favourite electricians' contention, that a very much smaller bulk of gas used to generate power for electric lighting than would serve for lighting in the ordinary way, will produce a superior lighting effect through the medium of arc lamps. There are arc lamps in the Grimsby Town Hall—all, of course, popularly assumed to be of 2000-candle power; and it is to be supposed that the ratepayers rejoice in the brilliancy of this illumination, and fully appreciate the "advanced" spirit of their representatives in the Corporation as manifested in conferring such a boon upon the town. But besides the gas for the engine, there is attendance to be paid for, and carbons, and small stores, which would be cheap at £50 a year; and there is interest on the capital at 3½ per cent., redemption, and depreciation to be provided. Altogether, the Town Hall lighting cannot stand the town in less than £250 a year, if it is not really dearer, which is getting near to three times the cost of gas lighting. This is the way in which these experiments work out everywhere, if the truth is confessed; but neither Grimsby nor Bradford, nor St. Pancras, gets the truth of this matter told to it in this unadorned fashion. It is usually the point of depreciation charges that is waived in official statements of the cost of working central stations; but there is a Nemesis for this vagary in accountancy, which is certain to put in a dreadful appearance some day. When that day arrives, the ratepayers will be roughly awakened from their Fools' Paradise; and great will be the lamentation in official quarters. The only safety lies in fairly and squarely facing this painful subject of plant renewals and depreciation; but where is the electric lighting undertaking which does this, besides having a closed capital account and charging every working expense to revenue?

Mr. T. Settle has received the appointment of Engineer and Manager of the Knaresborough Gas-Works, in succession to Mr. W. Stansfield.

The Returns as to Gas Undertakings.—These returns (for the year ending Dec. 31, 1892, as regards Companies, and March 25, 1893, in the case of Local Authorities) were presented to the House of Commons last Friday, and ordered to be printed. As this order has been given several months after the usual time, the publication of the returns, which generally takes place early in December, may possibly be somewhat delayed.

A TEXT-BOOK OF HYGIENE,

With Some Reference to House Ventilation and Gas Lighting.

A GERMAN treatise on "Hygiene," which Professor William Crookes, F.R.S., has judged of sufficient merit to be Englished by himself,* should not require any other recommendation to the respectful consideration of all students of the many subjects included in the comprehensive name of the science of health. We must plead guilty to not having heard of Professor Lehmann, of Würzburg, as an authority on this matter before Professor Crookes introduced his work to readers of English only; and, to make complete confession, it is not in Germany that we should have sought instruction in practical sanitary science. It is true that bacteriology has been cultivated by German professors with conspicuous ability and devotion; but there is frequently a gulf between what is studied in university laboratories and class-rooms, and what is practised at the very doors of these temples of learning and science. Practical sanitation is an English speciality. Long before the comma-shaped bacillus was dragged into the light of day, with the others of this fearsome brood, our physicians had discovered the connection between dirt and disease, and our public authorities had set about that general cleaning up of the land which has already had the result, notwithstanding mistakes and imperfections, of rendering the United Kingdom the sweetest country of the world, and its capital the healthiest as well as the most populous in the universe. We began at the bottom, and disestablished the shallow well and the cesspool, before troubling to find out the precise mechanism of germ or poison by which the time-honoured connection between these barbaric conveniences was rendered so pernicious to their users. In Germany, the study of sanitation has been begun at the other end; and so it is quite possible for the humblest English engineer, travelling through or abiding in that country of many universities, to have his sanitary sensibility grievously shocked by the actual surroundings of these same centres of light and leading. Professor Crookes has not overlooked this aspect of German hygiene, which is indeed sufficiently obvious to every travelling possessor of an English nose; and in his introduction to his author he admits that the Germans "are less sensitive than ourselves on the question of sewage gas." This is a very mild way of stating the facts. The conditions of the country may be better now; but it is certain that not many years ago what is termed in refined scientific and medical society "the fæcal odour" was one of the first of the impressions received by a visitor to such a good old German town as Würzburg, as it was one of the most clinging *souvenirs* of his passage.

Professor Crookes remarks that, "in hygienic regulations, Germany is in advance of us in some respects, whilst in others she remains in the background." This is undoubtedly true, speaking of "regulations;" and it must be ascribed to the fact that the sanitary sense of the German people has not yet been awakened. They have never been noted for bodily delicacy, to say the least; and it is to be hoped that, now their leading men of science have succeeded in setting up the bacillus as the great bogey of the century, the local authorities may be frightened into a better system of town management than they have hitherto held to be necessary. It is time, however, to proceed from Professor Crookes's introduction, and the reflections suggested thereby, to the contents of the book before us.

Professor Lehmann's work is divided into two parts, which are each subdivided into several sections. The subject is treated from a chemist's standpoint; and the author is mainly concerned to explain the different examinations, tests, and analyses which are incidental to hygienic investigations of all kinds, whether these are concerned with the foods and beverages consumed by the people, with the air they breathe, the dwellings they inhabit, the means whereby they warm and supply themselves with artificial light, or any other necessary of modern life. His first part deals with general methods of physical, chemical, and biological investigation; and it does this with German thoroughness and particularity, as may be judged from his devoting a page to the illustration and description of the common laboratory form of Bunsen burner. He does not trouble the reader with systematic chemistry, but goes straight to the point of what reagents to use and how to use them. It is the same with his spectroscopy and volumetry, which are described as it were with the apparatus in hand. With this book before him, the student can get to work at once. This is the natural way of teaching; just so much of the why and wherefore being given in passing as is necessary to keep the learner aware of the meaning of what he is about. A sufficient bibliography of every process and subject is given to indicate where more information may be obtained. We have no hesitation in commending those portions of the book which deal with laboratory methods as splendidly done, and showing the master-hand in every line. The translator has rendered his author as literally as possible; while he has been watchful to put him in accord with English conditions wherever this is necessary, and has supplied notes bringing the matter up to the latest date.

When he comes to the application of the results of hygienic

* "Methods of Practical Hygiene." By Professor K. B. Lehmann, Würzburg. Translated by W. Crookes, F.R.S. With numerous illustrations. In two volumes. London: Kegan Paul, Trench, Trübner, and Co., Limited; 1893.

investigations to the ordinary conditions of life, Professor Lehmann, as his translator is careful to point out, manifests a robust common-sense, and, "as a sanitary reformer, does not recommend extreme measures, and rejects unfounded and alarmist assertions." This is an additional reason for respecting and following him which English students are certain to fully appreciate. We are all tired of the sanitarians who want us to pack up and be off to a City of Hygeia, to which they cannot give the route, or who would terrify nervous people to death about the malefic germs that are stated to lie in wait for poor humanity everywhere.

It is not necessary for us to express an opinion upon the section of the book which is devoted to the examination of drinking water, since if the English Editor cannot be trusted to disemminate accurate and helpful information concerning this subject, there is none to be had from any living authority. We therefore pass over this part of the work with the statement that it is treated with the fulness deserved by the importance of the place of water supply in practical sanitation. Professor Lehmann's views respecting the essential qualities of potable water are broad and sound; and it is worthy of notice that Professor Crookes has not found it necessary to modify his statements in any essential particular.

The local colour appears very strongly as soon as the author attacks the structural questions arising in connection with the building of dwelling-houses. There is not much instruction for English builders, for example, in the statement that "walls built solid, if loaded, must be at least from 25 to 30 cm. in thickness." The metric system is used appropriately enough for the analytical part of the work; but it is out of place in regard to bricks and mortar. Again, it is all very well, in contemplating flooring from the hygienic stand-point of a German, to say that "the boards should be dovetailed to each other, and either be laid in asphalte or lined below with impervious roofing-paper;" but it is useless to translate such remarks into English, for they are hardly sense, much less of practical value.

The sub-section on artificial illumination begins with coal gas; and almost the first thing Professor Lehmann has to say upon the subject is that coal gas, "how brilliant soever may be the illumination it produces, is bad hygienically if its proportion of carbon monoxide exceeds from 5 to 7 per cent." This is a hard saying; but what we find still harder is a foot-note on the same page, which says: "It is not sufficiently known that, by a simple process invented by the Editor, the carbon monoxide may be completely removed from water gas." With all respect to Professor Crookes, it may be objected that this is a heavy claim to be advanced on behalf of a process which, so far as is generally known, is a paper device only—not being at the present time in operation anywhere. Professor Lehmann remarks that the odoriferous constituents of coal gas betray the danger of poisoning by carbonic monoxide; this appearing to be the only danger of which he is greatly afraid. His observations on the subject of gas-burners are very sketchy; showing that the latitude of Würzburg is unsuitable for determining the importance of gas lighting in connection with public health. For measuring the illuminating power of lights, or the illumination of a lighted surface, the photometer of L. Weber, as manufactured by the firm of Schmidt and Hänsch, is recommended. As a model for investigations into the effects of different systems of lighting public buildings, F. Renk's report on the lighting of the Munich theatres is cited. It may be remarked that there is a good supply of literature in English relating to this matter, of the existence of which the author does not seem to be aware. On the subject of warming apartments, it is obvious that the divergency between the common practices of Germany and the United Kingdom renders a German writer unable to instruct an English reader. The Editor has an almost savage note on the iniquitous method of heating rooms by open fire-grates; but it by no means follows, from the popularity of slow-burning porcelain stoves in Central Europe, where the average winter weather can be depended upon to remain equable for weeks together, that the same appliances would satisfy the English householder. It was certainly hardly worth while to translate this part of the work, even for the sake of the wise caution that "if a chimney seems blocked up with soot, the chimney-sweep should be consulted."

Although Professor Lehmann has not a great deal to tell us in regard to the topics usually dealt with in the JOURNAL, and his bibliography of the subject of gas lighting in relation to hygiene is conspicuously poor, we can conscientiously recommend the book as a valuable aid to the student and practitioner of sanitary science. Not even a Würzburg Professor can be supposed to know everything; and it cannot be imputed as serious blame to the author that he appears to be, on the whole, a safer guide in the laboratory than out of it. If his book does not contain all that it might have comprised, there is in it a vast amount of useful matter; and it is certainly a manual that no sanitary officer should be without.

Institution of Civil Engineers.—The opening meeting of the Institution for the session 1893-4 will be held this evening, when the President (Mr. Alfred Giles) will deliver his Inaugural Address, and afterwards present the medals and premiums awarded to the authors of several papers dealt with during the past session.

NOTES.

Incandescent Gas-Burners for Street-Lighting.

Dr. E. Schilling, of Munich, has communicated to the *Journal für Gasbeulechtung* a statement respecting an experiment made by him in street lighting by means of incandescent gas-burners. He remarks that the growing popularity of these burners for private lighting has caused the authorities of several towns to wish to take advantage of their superior brilliancy and economy of gas in connection with public lighting. It is admitted that various kinds of high-power gas-lamps have been successfully introduced into public thoroughfares, to the great improvement of the lighting; but none of these has struck the public fancy in the same way as the incandescent gas-burner appears to have done. In Munich, particularly, the authorities desired to see what could be done with these latter lamps in the streets; and accordingly on Dec. 6 last Dr. Schilling started 10 of them in a street 225 metres long. This was unsatisfactory—the lamps not being placed thickly enough; and in February another street, 500 metres long, with 26 lamps, was taken for a similar experiment. The incandescent mantles gave a horizontal illuminating power of 39 Hefner-Alteneck units, without the lantern. The illuminating power at different angles, reduced to the same standard, was as follows:—

At 30° = 35·3	At 60° = 13·1
,, 40° = 29·4	,, 70° = 15·0
,, 50° = 23·7	,, 80° = 10·3
,, 55° = 22·1	,, 90° = 13·7

The cost of street-lighting by this method is largely influenced by the expense of the mantles; but where the amount of illuminating effect is taken into the account, as it is in the Continental practice, the average cost per candle is not excessive. It is evident that the practicability of employing the incandescent gas-light out of doors greatly depends upon the degree of care that can be exercised in the lamp service.

The Latest Form of Pyrometer.

Professor W. Chandler Roberts-Austen has in his last series of Cantor Lectures before the Society of Arts, recently published in full in the Society's Journal, dealt very fully with the subject of thermometers and pyrometers, the importance of which in connection with furnace work of all kinds has been recognized for centuries. The lecturer speaks very highly of the improved form of Siemens pyrometer devised by Mr. H. L. Callendar, with whom he worked for some days at the Royal Mint; and he is satisfied that, at temperatures exceeding that of bright redness, the comparative readings of the Callendar instrument are accurate to one-tenth of a degree. Such accuracy would have been considered impossible a few years ago; and it marks a great advance in practical pyrometry since the article on the subject was prepared by Mr. N. Shaw for the last edition of the "Encyclopœdia Britannica." Professor Roberts-Austen also states that he has constantly worked with the Le Chatelier pyrometer (the most improved form of which he described) since 1889. An interesting description was given by the lecturer of the latest departure in pyrometry, by which curves are automatically obtained. This is done by confining the image of the mirror to a minute spot upon a sensitized plate moving at a uniform rate. In this way a record may be obtained of the temperature changes in the working of a furnace or retort, from which deductions of much importance may be drawn.

The Duty of Steam-Pumps.

In the course of the discussion on a paper upon the working of steam-pumps read by Mr. Alexander Borodin before the Institution of Mechanical Engineers, Mr. Lloyd, of Messrs. Hayward, Tyler and Co., gave a useful formula for finding the duty of a pump. He stated the rule as follows: Let P equal the steam pressure per square inch; A, the area of steam cylinder (presumably the area of the face of the piston subjected to the steam pressure); and a, the area of the pump-ram. Then the duty would equal $P \times 1{\cdot}735 \times \frac{A}{a}$. Professor Hudson Beare also defended the pulsometer as a fairly economical form of pump; stating that its consumption of steam is 147·6 lbs. per horse-power-hour. It was pointed out that in many cases pumps appear to be extravagant steam users, because they are designed to cope with the maximum demand that is ever likely to come upon them, whereas much less than this full power is usually required in the ordinary way; and a machine habitually worked much below its full capacity can hardly be expected to show very economical results.

Jewels from Gas Coke.

A remarkable product of the treatment of a mixture of powdered gas coke with sand and salt in the electrical furnace of M. Moissan is the beautiful sapphire-like compound which has received the name of "carborundum." It is properly speaking carbide of silicon; and it has been made in America by Mr. Acheson since a period vaguely stated as some time anterior to the publication of M. Moissan's description of it to the French Academy. It is obtained in crystals possessing many of the qualities—more particularly the hardness—of the diamond. According to the purity of the materials employed in their manufacture, these crystals are colourless, or coloured

yellowish green, bluish green, or pale blue. The process essentially consists in heating any suitable form of silica and carbon mixed together to a temperature of 3500° C. Upon the large scale, the cheap materials coke and sand answer very well, with salt for a flux. The latter ingredient acts mechanically, and causes the unattacked portion of the ingredients to cake together; thus facilitating the separation of the crystals. It also prevents the loss of the carbon by surface oxidation. The crystals obtained by employing silicate of alumina are usually colourless or pale blue; and they have been used by Mr. Tesla in his new lamp for the transformation of electrical waves into waves of light. The small crystals are used commercially for grinding.

The Representation of Stream Currents.

In a recent number of *Wiedemann's Annalen*, M. Czermak publishes some beautiful photographs of ascending current effects in gases and liquids, which would form interesting lecture demonstrations of cloud formation, effects of ventilation, &c. For procuring the former, a rectangular box made of plate glass was used, on the bottom of which a clock-spring lay. This spring could be heated by the passage of an electric current. A tube at the bottom of the box served to admit smoke, and another at the top was employed for ventilation or the admission of a light gas. Smoke blown in through the tube was seen to lie spread out evenly over the bottom of the box, like a ground mist, provided all parts of the box were at the same temperature. On sending a current through the spiral spring, the mushroom-like figure first described by Vettin was observed to rise in faultless symmetry. In order to imitate more closely the actual condition of the atmosphere during the ascent of warm air currents, the upper part of the box was filled with coal gas. The stream-figure then ascended in the usual manner until its vertex reached the lighter stratum. It then became stationary, expanded in the stratum where diffusion was taking place between the air and the gas, and part of the smoke flowed back to the bottom. Sometimes it was found possible to obtain a cloud-like structure, with a dome in the centre and wavy outlines. It is obvious much information respecting cloud and fog formation might be obtained by the careful use of simple apparatus of this character.

The Shale Oil Industry in France.—According to the *Annales des Mines*, the extraction of oil from bituminous shale commenced in France soon after the first researches on the subject by Laurent de Reichenbach about 1830; and the employment of shale oil for lighting purposes in that country dates from 1839, when Selligue, who commenced to distil oil from the shales of Autun, succeeded in refining it. The principal deposits of bituminous schists actually found in France are those of Autun and Buxières-les-Mines, worked regularly, the first since 1862, and the second since 1868. There are also some workings in the departments of the Var, the Puy de Dôme, and the Basses Alpes. But of the 210,000 tons of bituminous shales (of which 9000 tons were Boghead) produced in 1890, the Autun bed yielded 156,000 tons, and that of Buxières 51,000 tons. The bituminous schists of Buxières and Autun belong to the Permian formation.

Incandescent Gas Lighting.—At a recent meeting of the Brussels Section of the Liege Association of Engineers, the present condition of incandescent gas lighting, was dealt with by M. Sepulchre, the inventor of the mineral-oil lamp which bears his name. He described the manufacture of Welsbach burners, especially the mantles; and he showed that it is possible with these burners to obtain flames of different colours. He produced the results of experiments, which proved that the cost of these appliances is soon compensated for by a diminution in the quantity of gas consumed, while at the same time the light afforded is remarkably intense. Subsidiary advantages attending the use of these burners are that the temperature of the room is not so much increased, or the atmosphere so vitiated, as with ordinary burners. On some members asking if the latter advantages were not counterbalanced by the fragility of the mantles and chimneys, M. Sepulchre replied that at first the manufacture of the chimneys was not quite satisfactory, but that now these reproaches could no longer be brought against the burners, which were coming more into use every day. These particulars were confirmed by M. Aerts, the Gas Engineer to the Brussels Municipality, who observed that, in consequence of the success obtained with incandescent burners, a question was raised as to the advisability of generating gas for heating instead of for lighting. But he gave figures to show that the gas which is of the highest illuminating power also has the greatest calorific capacity; and it was this consideration, he said, which induced the Manager of the works to enrich ordinary coal gas with gas produced from mineral oil; a double plant, for working alternately in four-minute periods, being now erected for the purpose. The new apparatus would produce water gas, which would be enriched by the aid of petroleum vapour; the mixture being superheated for fixing it. He added that this new method of manufacture might be carried on with any oils; but those called "intermediate" were to be preferred—Russian petroleum being the best. The plant at the Brussels Gas-Works would permit of the daily production of 20,000 cubic metres (706,300 cubic feet) of 25-candle gas, with a yearly consumption of 3000 tons of petroleum.

TECHNICAL RECORD.

AMERICAN GASLIGHT ASSOCIATION.

Annual Meeting at Chicago.

The Twenty-first Annual Meeting of this Association was held at Chicago on the 18th, 19th, and 20th ult., under the presidency of Mr. A. E. Boardman, of Macon (Ga.).

According to the Official Report of the proceedings, which is commenced in the current number of the *American Gaslight Journal*, the first business was the admission of new members. This was followed by the presentation of the report of the Council on the management of the Association during the year, which was read by the Secretary (Mr. A. B. Slater, jun.). It stated that the Council had had under their consideration the paper on "The Gas Association and Its Members," read by Mr. W. R. Addicks at the previous meeting; and, in view of the value of the matter therein set forth, they recommended the Association to recommit the subject to them for further consideration. The Council made two recommendations in relation to the publication of the proceedings—viz., that the publication of the reports should not be made in full in any other form than that in which it should be issued by the Association to the members, but that gas journals should have the privilege of publishing synopses of the reports; also that the proceedings should be published by the Association in a quarterly, instead of the usual biennial form. The President offered a few explanatory remarks upon the recommendations in the report; and it was adopted. The reports of the Treasurer and the Secretary were next submitted. The former was ordered to be filed when duly audited; and the latter, to be entered upon the minutes. It was then stated that, owing to deaths, there had been no meeting of the Special Committee appointed to consider the question of a standard meter union; and further time was granted them, with the privilege of adding to their number. The election of officers was next proceeded with; Mr. W. H. Pearson, of Toronto, being chosen President for the ensuing year. This gentleman having briefly thanked the members, Mr. Boardman proceeded to deliver his Inaugural Address.

The President commenced his address by referring to the fact that the meeting marked the twenty-first anniversary of the birth of the Association, and by pointing out the singular appropriateness of the celebration of its coming of age taking place in Chicago, where the world was celebrating the discovery of the American Continent. It was appropriate, he said, because the gas industry had been so important a factor in the advancement of the civilization of which the crowning glory was the World's Columbian Exposition; and also because the economical increase in the number of hours which might be profitably employed had hastened the progress of the race. He thought it would be most instructive and entertaining, at this time, to summarize the history and accomplishments of the vigorous young body which was just reaching the legal age of maturity. But its history lay in the life-work of the members; and its accomplishments in the position the gas industry had now attained throughout the land. Hence it was beyond the province of a presidential address. Before leaving this subject, however, it was well to pause and think with gratitude of the founders of the Association, and reflect with regard to so many of the men to whose enterprise and devotion the inception and establishment of the society were due who had joined the "silent majority." Of the original members, only eleven were left; and it was to be sincerely hoped that their presence might cheer and encourage their fellows for many years to come. These remarks naturally led to a reference to those members who had been removed by death during the past year, and to their work; and then the President passed on to deal with general matters affecting the gas industry—his remarks being as follows.

During the year the business of the Association has prospered; and your Council has been diligent in promoting the interest of the Association in every possible way. Matters of considerable moment have been thoroughly discussed; and I can heartily endorse the recommendations that will be presented for your consideration and adoption. At the Boston meeting, a paper read by Mr. W. R. Addicks, on "A Gas Association and Its Members," created widespread interest and considerable enthusiasm among the members of this Association. The Council has had the subject in mind; but the discussion developed the fact that the plan outlined, although very desirable, was hardly adapted to the requirements of the Association as they now exist, and that a concerted action of the various societies would be necessary to accomplish results. Therefore, further thought and consideration are deemed advisable. A study of the plan in operation in Germany and that proposed by the British Societies might be profitably made before mapping out one for this country. At a meeting of an English Association, resolutions were passed which might give us a hint as to the method to be pursued. [The President quoted the resolutions passed at the meeting of the South-West of England Association in April last.] This is an important matter for the future of our Association and for the advancement of our profession; and it is none too early to begin the work of federation in earnest.

In visiting the World's Fair and viewing the many wonderful

and beautiful exhibits, that which will most attract a gas man is the marvellous display of the progress of electricity as applied to the uses of man. The development in this direction has been indeed marvellous; and nowhere else can this progress be better seen and appreciated than in the White City, at Jackson Park. It makes more poignant the regret we feel that no adequate exhibition has been provided of the uses of gas. The masses will be persuaded that the claims for electricity as being the light and power of the future are fully demonstrated. It is only those conversant with the true state of the comparative cost and possibilities of the two, who can feel encouraged for gas, when face to face with the results in electricity now on exhibition. To the leaders in this industrial contest, however, the present view of the entire field is most encouraging to the gas maker; and the display of the whole strength of the opposing forces should only nerve our hearts and hands to still greater exertion, in order to place our product more prominently before the public. To this end, I desire to call attention briefly to one or two directions in which we can push our advantage.

Two of the reasons why many prefer the electric incandescent lamp are its freedom from liability to injure daintily coloured walls and ceilings, and the small amount of heat developed at the burner. The light emitted is not so great as a good gas-jet of the ordinary pattern; and the cost per unit of light is much in favour of gas. Unfortunately, in our efforts to increase the illuminants in our gas, we increase the liability of the burners to smoke; and the light emitted bears a very small ratio to the heat produced in burning the gas. Our best examples of regenerative burners are liable to smoke; and the heat developed is a serious hindrance to their adoption, as well as is the large first cost. Hence it was that many of the progressive gas engineers welcomed the appearance of the Welsbach incandescent gas-burner as a departure in the right direction from the ordinary method of using gas for light. The first of these burners proved disappointing, however; and the fear was entertained that the defects were too radical to admit of remedy. Not discouraged by lack of success, experiments to perfect the burner were continued; and now, with the improvements resulting, we have reason to believe that the burner in its latest development, can be made to compete successfully with the incandescent electric lamp. With the best regenerative burners, an efficiency of 10 candle-feet has been considered a very marked advance in gas lighting; and so it was. But a Welsbach burner gives a lighting efficiency to begin with of fully 22 candle-feet; and during the first 1000 hours the depreciation amounts to only 35 per cent., when it still gives an efficiency of 15 candle-feet. Compare this with the incandescent electric lamps, and we find the depreciation to be fully 43 per cent. in the same length of time. I have a record of a Welsbach burner which had an efficiency of 22·7 candle-feet when first lighted; and, with a slowly decreasing efficiency, at the end of 7000 hours' burning gave 9·3 candle-feet, or about equal to the best regenerative burners. Could the mantles to these burners be furnished and placed in position at as little cost as a glow lamp, the great economy in the gas used would be an inducement for every one to try them.

The quantity of heat emitted for the amount of light is astonishingly small. In this respect, quoting from Herr von Oechelhäuser, of Dessau: "As an ordinary gas-flame of 16-candle power develops about 900 calories, a Welsbach burner of 50-candle power, with about 540 calories, gives only two-thirds of the heat of an old gaslight of 16-candle power; or if this luminosity of 16-candle power be taken as a basis of comparison, only about 170 calories are developed, and therefore about *one-fifth* of the heat previously associated with 16-candle power light. According to Renk, an electric glow lamp of 16-candle power develops 46 calories. Therefore a 16-candle Welsbach light gives only 3½ times the heat of the electric incandescent light; whereas hitherto a gaslight of 16-candle power has produced nearly 20 times the heat. A diminution of the heat as compared with electric light from 20 times to only 3½ times, is, in practice, tantamount to light without heat." And in regard to the liability to damage walls and ceilings, Herr Oechelhäuser continues: "The products of combustion have naturally diminished with the quantity of heat to one-fifth of that previously produced for the same luminosity; and, besides this, the combustion of the gas is so complete that the formation of soot is quite out of the question." There are two other points in regard to the Welsbach burner that will contribute largely to its ultimate success. One is that the area of the luminous surface in the gas-burner is about eight times that of the electric lamp, and must therefore have greater diffusive power, and be less hurtful to the eyes. The second is that an increase of pressure in the gas supplied enhances the efficiency of the burner; and this, too, without decreasing its life. This will enable the future engineer to distribute a much larger quantity to his consumers through the same mains as at present, without decreasing his candle power at the burner; and since the diminution of candle power caused by great pressure, as effected in an ordinary burner, does not obtain to any appreciable extent in the Welsbach, ordinary gas may be furnished to suburban dwellings much as Pintsch oil gas is supplied to railway cars.

The observance of the fact that the compression of gas, as ordinarily made for illuminating purposes at our works, does not lower its heating power in a degree at all comparable with the decrease in its illuminating value as generally used, leads me to another field that is open to the gas maker, but which is at present occupied almost exclusively by the electricians. Of course, we are more or less familiar with the gas-engine, and great benefit it has conferred upon the gas maker, as well as the users of small power; and competition with the electric motor in the ordinary uses for small and intermittent power is well under way. Nothing that I could say would add to your appreciation of the importance of pushing our advantage in this respect. But it is to the use of the gas-engine as a motor for street cars that I wish to particularly call your attention, and to counsel a thorough and diligent study of its great advantages over electricity. As in the case of the Welsbach burner, the first attempts to adapt the gas-engine to this particular service were quite discouraging. But similar perseverance has brought about corresponding success; and you have in this city at the present time examples of the satisfactory use of gas-engines as street-car motors. In the earlier experiments, it was thought necessary to use Pintsch gas, because the supply for the engine must be compressed. But lately recognition of the small effect of compression on the heating power of ordinary illuminating gas, led to a trial of using it in place of the Pintsch gas; and the results have been more gratifying than the inventors dared to hope. Ordinary gas compressed, as was the Pintsch gas, was found to give 80 per cent. of the efficiency of the latter; and, of course, at much less expense.

The cost of building and equipping a street railway for the use of gas-motors is considerably less than for electricity, even with the overhead trolley, which must very soon be discarded for the much more expensive system of underground wires. The running expense and repair accounts for a road operated by gas-motors are far less than one operated by electricity; and the erection and maintenance of a power station is entirely unnecessary in a town having gas-works. The gas company can compress the gas and deliver it so compressed at the street-car stable; or a small room at the stable can be devoted to the compression machinery, and a gas-engine to furnish the power to operate it. In either event, the street railways could be made large gas consumers, to the mutual advantage of the shareholders in the street railway company and the gas company.

When I think of the many and varied appliances by which light, heat, and power may be furnished to our consumers, by means of the gas flowing through a single set of conductors—and I notice that greater economies are being effected along the lines of developing and utilizing the great heating power of our product—the thought is forced upon me that perhaps we have been pursuing a wrong policy in adding costly enrichers, in the shape of cannel coal, oil, and the like, to increase the luminosity of the gas without correspondingly increasing its heating power. Should we not have made more real progress in developing and utilizing the much greater heating power of our gas? I do not wish to be understood as advocating the manufacture and distribution of a fuel gas, such as has been heretofore designated as a fuel gas. Such a proceeding would necessitate the abandonment of many appliances already invented and adapted to the gas now in use, as well as the invention and manufacture of new ones to suit the fuel gas; and this would be doubtful business policy. What I do advocate is the energetic introduction of all appliances for light, heat, and power that are best adapted to the economical production of each by the use of the most powerful attribute of our gas—its heating quality; the manufacture of the gas having the greatest heating power per unit, at the lowest cost; and its distribution under greater pressure than at present, so as to increase the carrying capacity of our mains at the least expense.

A review of the advance in the quantity of gas sold by the various manufacturers during the past year is very gratifying; and the decrease in the cost to the consumer has been quite general in all parts of the country. How much of the increase in output has been due to the extended use of appliances other than for lighting, it would be interesting to know. It is evident that the inroads made by electric lighting have been counteracted in almost every instance; and the use of gas is steadily advancing. However gratifying this may be for the future as to the use of gas, there are tendencies growing which cause grave apprehensions to those of us who have direct charge of, and are interested in, the properties themselves, as well as in the results of manufacture. I allude to the growth of communistic ideas in all our cities, which is made manifest by the efforts in all parts of the country to operate the works on behalf of the people alone, irrespective of the ownership. In many instances, it is by the condemnation and purchase of the works; in others, by the forced reduction in prices under laws made by the representatives of the very people who are to be most benefited at the expense of the vested interests of the actual owners. Nor are the Courts free from the influence which directs these movements. Themselves the appointees of Legislatures elected by the popular vote, it is impossible for them to be free from bias and independent of public sentiment as controlled by public greed.

Nor are the gas companies alone the sufferers from this growing tendency. Water-works and electric works are alike subject to the popular sentiment for municipal control. Street railways, and even steam railways and telegraph lines, are being looked upon as suitable properties to be converted to the ownership of the State. The marked example of the ills of

municipal ownership of such works as are exhibited in the Philadelphia Gas and Water Works and the Wheeling (W. Va.) Electric Works, and others that might be mentioned, do not deter other cities from like experiments; nor do they serve to educate even such as make a study of economic questions, unless they are especially equipped by a knowledge of the gas business. How we may best protect our properties from attacks similar to those made upon the Cleveland, Boston, and Detroit Companies, and from almost confiscation, as has been the result in some instances under my own observation, is a matter of much import to members of this Association. The encouragement that the gas companies in each State, with proper co-operation, might extend toward the appointment of State Commissions, similar to that in Massachusetts, is well worthy of trial. Still we must not shut our eyes to the danger that lies in placing so much power in a Commission that might be controlled by politics or influenced by popular clamour.

In the near future, many of those within sound of my voice will be called upon to decide, as experts, upon the value of works which municipalities will attempt to confiscate under cover of law. Fortunately, the law provides for an arbitration upon the price to be paid for private property taken, or condemned, for public use. Upon our proper understanding of what constitutes such works, our ability to explain it to the lay members of the Arbitration Board, and our firmness in maintaining our convictions, depend the safety of investors in gas securities. The popular idea, and the one we shall have to combat almost single-handed, is that the value of a gas-works consists in the cost of the pipes, *plus* the labour of laying them, the present value of the real estate, and the cost of buildings, holders, and machinery; in short, the amount of money it would require to construct a duplicate plant at the time the arbitration is made—only that, and nothing more. We suggest the value of the franchise, rights, and privileges. They argue that these were given to the company, and cost nothing; and, besides the city does not need them. Given, indeed! We know very well that they were acquired by the expenditure of large sums of money at very great risk; by the unremitting labour and thought that have been expended in building up the business and complying with the requirements of the franchise, and by the many years of weary waiting for interest to be paid upon the investment in the infancy of the undertaking. We place a valuation upon the "goodwill" of the corporation. The witty member of the Arbitration Board wonders if any gas company ever possessed the "good will" of its customers. The serious member intimates that, if the city should build opposition works, all the customers could be obtained from the company with only the expense of connecting them; in short, that by its own action the municipality can depreciate the value of the property under consideration, and that therefore it should be allowed to take advantage of this fact.

We should maintain that the property should be valued to the municipality at no more and no less than to private parties, real or artificial. A private purchaser would consider the earning power of the plant under a fair price for the product, the previous rate of growth, the district to be supplied (whether residential, manufacturing, commercial, or all together), and the probable increase in the near future. He would also consider the capacity of the plant to supply the present and prospective demand, and the probable expense necessary to increase that capacity. In short, he would look at the value of the works as a live and productive piece of property, and not as a collection of land, buildings, machinery, and pipes. He has been known to give three millions of dollars for works that could be duplicated for half that amount; and who would say that the previous owners should have been forced to sell to the city for a million and a half of dollars, or that the purchaser should be allowed to charge for gas only so much as will pay him a fair rate of interest on the cost of the duplicate? Hence it is as a living entity that we must treat a gas or a water works, and value it in accordance with what it will do.

And this suggests another thought. In our papers and discussions, we have frequently, and very properly, insisted upon maintaining a small capitalization per 1000 cubic feet of output per annum; and we have been tempted to criticize severely the large capitalization of some of the works in our principal cities. While the smallest amount of capital possible per 1000 cubic feet of output is very desirable from the engineer's standpoint, and enables him to make much better dividends at a lower charge to consumers, it is not always fair to the stockholders, or safe as business policy. He who invests in real estate in a good location and in a growing city enjoys increasing returns upon the amount originally invested, and sees the saleable value of his property steadily increase, without any labour or further expenditure on his part. He who purchases stock in a newly-chartered bank, which, by good management, fortunate position, and growing population, has its deposit account greatly augmented, and lays by a handsome surplus, enjoys increased dividends and market value of his stock without personal labour or outlay of more capital. He who builds a factory, and, by his own efforts and management, and by the increase in the population to be supplied, is enabled to amass wealth, enjoys the fruits of his labour as well as the unearned increment, as in the other cases. In none of these instances is his right to enjoy the increased earning power and value of his property questioned. But should he invest in a railway, a gas-works, a water-works, an electric lighting works, or in any corporation enjoying State or Municipal franchises, and used by the public, and his dividends increase by reason of the growth of population and demand for its services beyond the average interest upon money, then is demand made upon him to share his good fortune with the public, or to refund all that he may receive in dividends above the interest rate. It matters not whether this increased prosperity is the result of former deprivations and savings, or of careful management, or merely of fortunate circumstances outside the control of the corporation.

The public can protect itself from extortion in two ways—either by inviting and encouraging competition, as in the case of manufactories having the entire country or world for a customer; or, where competition is too expensive (as in the case of gas and water works, restricted to a narrow field for custom), it can become a profit-sharer by regulating prices while at the same time protecting investments. By assuring safety and permanency to invested capital, it can be had at lower interest rates; and by allowing increased profits to such undertakings upon conditions of lower prices to the public, a healthy stimulus is given to promote the use of improved methods and more careful management. The prevailing policy of destroying the element of safety and at the same time demanding all the profits above bare interest upon plant, is the great menace to our business—more dangerous than any competition we have to fear from electricity. To successfully combat, it will require our united and determined efforts; for the public must be educated to a right understanding of the questions involved, and to accomplish this will require many men and many minds. Let us hope the men and the minds may be found in the membership of the American Gaslight Association.

THE DEVELOPMENT AND TRANSMISSION OF POWER FROM CENTRAL STATIONS.

The fifth of the series of lectures delivered by Professor UNWIN at the Society of Arts on the above subject (see *ante*, pp. 762, 803, 848) dealt with the transmission of power by compressed air and by steam.

The lecturer commenced by giving a short sketch of the early attempts to employ compressed air in engineering operations; and he then went on to say that its application for the transmission of motive power to a distance appeared to have been considered by Papin in 1688. Triger actually transmitted power in this way a distance of 750 feet in 1845. In 1877, Mekarski used air compressed to 25 or 30 atmospheres, in conjunction with a small amount of high-pressure steam, to drive tramway cars; and he was one of the first to use compound compressors. In 1877, in Vienna, and in 1881, in Paris, M. Popp installed a system of working and regulating a great number of clocks by impulses of compressed air conveyed in pipes from a central station. A demand arose for a supply for working small motors; and this proved so successful that there has been developed in the city the most important system of power distribution hitherto carried out. The power is transmitted to industries of every kind over a large area by air compressed at a central station; and even sub-stations for electric lighting are driven by air-engines. An important installation has also been carried out in Birmingham. Compressed air has peculiar advantages in the case of underground transmissions. It has been unfortunate that, in both the Paris and Birmingham installations, there were conditions of development very unfavourable to the complete and fair trial of compressed air as a means of transmission. It is reasonably certain that, with greater attention to scientific principles, better results are attainable than have hitherto been reached. For the special purposes to which power distribution is applied in London, Professor Unwin thinks the high-pressure hydraulic system has great advantages. Where local conditions permit the construction of high-level reservoirs, a system of hydraulic distribution like that in Zurich and Geneva is perfectly successful; but, in more numerous cases, compressed air is likely to prove preferable to hydraulic transmission. It is also the most important rival of electrical distribution.

Passing on to consider generally the question of employing compressed air as a means of distributing power in towns, Professor Unwin enumerated the *desiderata* of such a system as follows: (1) The possibility of indefinitely subdividing the power distributed, and measuring the supply to each consumer. (2) Minimum first cost of distributing-mains, and minimum loss of energy in distribution. (3) Simplicity, cheapness, and efficiency of the motors required by consumers of power; and, especially, it is important that the motors should require little attendance and involve little risk. (4) Freedom from danger to life or property when accidents occur to motors or mains. (5) Facility of adaptation to various requirements additional to the supply of motive power. He thought a compressed-air system met these conditions on the whole more completely than any other hitherto carried out.

Particulars were next given of the Paris installation, the mains in connection with which extend for 34 miles; and then the air system was compared with the electric and other systems of furnishing power. The lecturer remarked that, in regard to

adaptability to various requirements, compressed air is in a very advantageous position. Electricity furnishes power and light; but it cannot be used for supplying heat, except at a cost prohibitive in most applications. Gas gives heat, power, and light; but, for lighting, it is open to obvious objections, and for heating and power it is expensive. Pressure water supplies power, and indirectly light, if a motor is used to drive a dynamo; but, except where cheap water power is the original source of energy, it is too expensive for most purposes where motive power is required. Steam supplies heat, motive power, and indirectly light, if a steam-motor is used to drive a dynamo; but it is more expensive than compressed air, and involves more risk and attention.

Professor Unwin then described the general arrangements of a system of compressed-air transmission. They included: (1) A compressing plant driven by steam or water power, with air reservoirs of more or less capacity to diminish momentary fluctuations of pressure. The compressors usually require the addition of cooling arrangements for absorbing the heat developed in compression. (2) A system of air-mains for distributing the compressed air to the working points. (3) Air motors driven by the compressed air, and sometimes provided with re-heaters to increase the work done by the air and diminish the cooling during expansion. The efficiency diminishes rapidly with increase of initial pressure; and, to obtain good results, the air must be used expansively. Practically, it is necessary to use pressures of 45 lbs. per square inch at least, so that the apparatus may not be too cumbrous. When using the air properly, much higher working pressures may be adopted without sensible loss of efficiency. With regard to losses in transmission, the lecturer stated that, in short distance transmissions, the loss of pressure in the mains is so insignificant that it may be neglected. In long-distance transmissions, an accurate estimate of the frictional loss is necessary. Using data derived from careful experiments on 20 miles of main in Paris, he thought he had shown long-distance transmission of power by compressed air to be perfectly practicable. It was possible, with compressors driven by engines working to 10,000 indicated horse-power, to transmit the air, in a main of not unusual size, a distance of 20 miles, and to obtain in motors worked by the transmitted compressed air from 4000 to 5000 indicated horse power if the air was used cold, or 6000 to 7000 indicated horse power if it was re-heated before use.

Coming to the question of the cost of working with compressed air, Professor Unwin stated that in the very imperfect small rotary motors used in Paris, the consumption of air compressed to five atmospheres (75 lbs. per square inch) is 750 to 850 cubic feet per effective horse-power-hour. Old steam-engines converted into air-motors use 450 cubic feet per effective horse-power-hour. The new compound air-compressors in Paris compress a cubic metre of air to a higher pressure than this for 0·4c. If 0·75c. per cubic metre is allowed, to cover interest on plant, as well as cost of compression, this corresponds to 1d. per 880 cubic feet. Hence, the cost of working with compressed air amounts to 1d. per effective horse-power-hour with the inefficient rotary motors, and about ½d. per effective horse-power-hour with the converted steam-engines. In the latter case, the cost corresponds to about £6 5s. per effective horse power for a year of 3000 working hours. Better results than these will be obtained when air-motors are studied as carefully as compressors.

The lecturer gave some interesting particulars of a scheme for distributing power, chiefly by compressed air, for Dresden. In this scheme, Dr. Prœll proposed to work an electric lighting station partly by air motors, and partly by gas-engines. The ordinary re-heating apparatus for the former is not very convenient in this case, in consequence of the great variation in the demand for power. Professor Unwin remarked that the gas-engine is a very efficient and convenient motor for an electric lighting station, because it can be put in action or stopped according to the variation in the demand for power, and there is no waste like that due to keeping boilers in steam ready for use; but a very large fraction of the heat developed is necessarily wasted in the water-jacket. Dr. Prœll proposed to abolish this jacket, and to take the compressed air through the gas-engine jackets, to re-heat it on its way to the air motors. In addition, the hot gases rejected from the gas-engine were to be used in the jacket of the motors. By this combination, a quite remarkable thermal efficiency could be obtained. It might be questioned, he continued, whether it would not be better to take the exhaust of the gas-engine directly into the current of air. Then the gas-engine would work with a heavy back-pressure; but the work so lost would be recovered in the air motor. He suggested re-heating by the burning of gas in the air-current, so that the whole of the heat would be utilized without chimney losses. Some attempts had, he said, since been made in this direction in America.

Professor Unwin closed this section of his discourse with some remarks on the distribution of power by compressed air at the works of the Société Cockerill at Seraing, and also on the Paris and Offenbach systems.

The concluding portion of the lecture was devoted to the subject of the distribution of power by steam. Steam distributed from a central station can be very conveniently used for heating purposes, as well as for supplying power; and its defects in the latter respect may be balanced by its advantages in the former. In America the experiment of distributing heat and power from a central station by steam has been tried on a very large scale, and with a considerable amount of success. Tracing the history of steam distribution, Professor Unwin stated that Birdsill Holly took out a patent in 1877 for a system having for its object heating only; and plants were put up on his system in many towns. The steam was carried in pipes having anchored stuffing-boxes at distances of 100 feet, so that expansion and contraction were provided for. The pipes were protected against radiation by asbestos and wood. Steam was distributed to each building through a reducing-valve, and used at low pressure in heating-coils in the ordinary way. As early as 1869, Mr. Emery investigated the problem of distributing steam in New York; the result of his studies being the creation of the largest system hitherto erected. He concludes that steam could be economically distributed from one station to buildings within a radius of half a mile. Ten plots for stations were secured; and work was commenced in 1881. The lecturer said he believed there were now two steam stations in the city—a down-town station, having boilers working up to about 16,000-horse power, and an up-town station, designed for boilers of 3000-horse power, and having about one-half this power at work. The pipes from the down-town station extend through about 5½ miles of streets; those from the up-town station, through 2¼ miles of streets. They work with steam at from 80 to 90 lbs. pressure per square inch. The main-pipes are of wrought iron, 16, 15, 13, and 11 inches in diameter outside, and about ¼ inch less in diameter inside. The steam is employed for a great variety of purposes, in addition to the principal one of warming buildings.

The concluding lecture was on the distribution of power by gas and electricity, an abstract of which is reserved.

The Effect of the Coal Crisis on the Gas and Electric Light Industries.—"The continued high price and scarcity of coal must," says the *Electrician*, "at length be telling seriously upon both the electric light and the gas industries. Some ignorant daily papers have been patronizingly telling us that now is the chance for electricity to take an advantage over coal gas—now, when the price of coal gas is bound to take an upward trend. But it is, of course, equally expensive to purchase coal for the one mode of lighting as for the other; while both have had an equally good chance of arranging for long-term contracts at fixed prices. Electric supply stations are, as a rule, very badly off for coal storeage compared with gas-works. As a matter of fact, however, we know of one instance—and doubtless there are others—where the boilers at the electric light station are supplied with coal from the gas-works. This looks at first like brotherly love of a very millennium order; but it is explained by the fact that both gas and electric light works are owned by the same Corporation—the Municipality. Anyway, money is being made and lost somewhere by the high prices in coal; and if the contract prices are favourable to gas and electricity production at the present time, it is a safe prediction that the next renewal of contracts will find the case quite altered. On the other hand, those generating stations which are not sheltered by favourable contracts must be thinking it is about time to raise the price of their units or their 1000 cubic feet, as the case may be."

Collieries and Colliery Engineering.—At the meeting of the Society of Engineers on Monday evening last week, under the presidency of Mr. W. A. Valon, J.P., a paper or the above subject was read by Mr. R. Nelson Boyd. The author commenced by referring to the great importance of coal to all manufactories and works connected with engineering. The output of this mineral had now, he said, reached the enormous total of 181,786,871 tons in one year, valued at the mines at £66,050,451. He then gave an interesting account of the old workings before the introduction of machinery, and showed how enormously the coal industry advanced after the invention of the steam-engine. He pointed out that the development of collieries led to greater danger, especially from the increased proportion of explosive gases present owing to the nature of the deeper seams and the larger surface of coal exposed by extended workings. This, he said, led to the invention of the safety-lamp and the introduction of systems of mechanical ventilation. The appliances used for this purpose, as well as the underground machinery generally, were referred to; and then the author dealt with the method of working the coal—giving a few particulars as to explosives. The concluding portion of the paper was devoted to the subject of the duration of the coal-fields. Mr. Boyd reviewed the results arrived at by previous investigators into this important question; and, basing his assumption on the figures they arrived at, he gave the period as 276 years. He explained, however, that this did not mean that at the end of that time we should have no coal. Coal would become dearer as the mines were deepened; and hence the necessity for the exercise of economy. In this connection, he animadverted upon the present wasteful use of coal; and mentioned petroleum and peat as possible adjuncts to this fuel. The author concluded with a few recapitulatory remarks, in the course of which he cited, as exemplifying the development of the coal industry during the century, the fact that at the beginning the total output of the mines was only 10 million tons per annum, whereas last year it reached, as mentioned at the commencement of his paper, nearly 182 million tons.

REGISTER OF PATENTS.

Coin-Freed Gas-Meters.—Carter, G., of Islington, N. No. 21,819; Nov. 29, 1892.

This invention—relating to gas-meters fitted with coin-controlled mechanism, which, on the insertion of coins of predetermined size and value, allows the gas-measuring device to act so as to automatically deliver to the purchaser a quantity of gas—has for its principal object to construct mechanism capable of being applied to any ordinary wet or dry meter, and at all times indicate the amount of gas, if any, to the credit of the purchaser; and which shall also be capable of being readily adjusted to deliver any quantity of gas per unit-coin to suit any variation in price.

Fig 1.

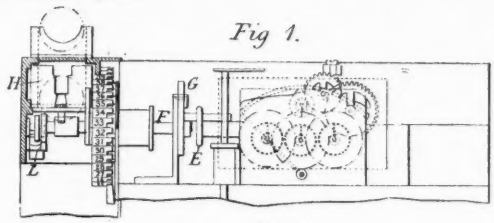


Fig 2

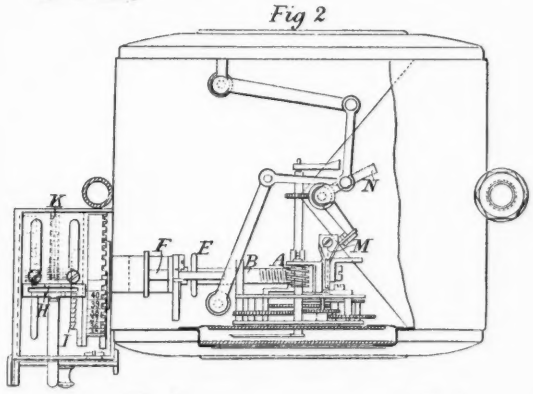


Fig 3.

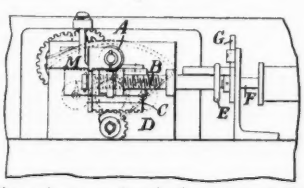


Fig. 4

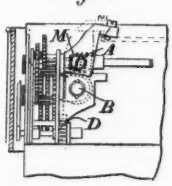


Fig. 1 is a sectional elevation of the meter. Fig. 2 is a sectional plan. Fig. 3 is a sectional back elevation of the measuring and indicating mechanism. Fig. 4 is a sectional end elevation.

In this meter, a worm A is mounted on the unit index spindle or arbor, and gears with a screw-threaded pinion, mounted on the threaded part of a sliding screw-rod B; the pinion being held in position laterally by cheeks, so that, as it is rotated, it imparts a longitudinal or axial motion to the screwed rod. Connected to, and partaking of the longitudinal sliding motion of this screwed rod, is a sliding toothed rack C, gearing with a corresponding toothed quadrant D (fig. 3), mounted on an arbor carrying an index-pointer working over an indicating dial; so that, as the screwed rod is slidden longitudinally in either direction, the index-pointer is correspondingly rotated. One end of the rod B has a flange E, provided with a slot, in which a crank-pin connected to an intermediate rod or spindle F engages, so as to connect the rod B to a coin-rack sleeve, so that the two rods B F may slide longitudinally relatively to one another, but must rotate together, and are prevented from rotating in one direction by a rachet and click or detent G.

The operating coin is inserted in a slot H (figs. 1 and 2) in a traversing carriage, working between suitable guides, and whose base rests and slides upon a base-plate of similar configuration, in such manner that, when the corresponding parts in the base and base-plate coincide, the inserted coin, in passing through the coinciding slots, locks the carriage and base-plate together—its motion being arrested by a saw-toothed coin-rack I, against which it presses, and which allows the carriage and base-plate to be withdrawn, but prevents their return to their initial positions until they have been withdrawn the full length of traverse allowed, when the coin, passing the end of the rack, falls into a suitable receptacle, and permits the return of the carriage and base-plate to their initial positions for a fresh operation. The return of the coin-carriage is also further prevented until its full traverse has been accomplished, by a hinged toothed lever, which engages with the inserted coin on the withdrawal of the coin-carriage. The carriage and base-plate are connected together by screws in the base-plate, which, when no coin is inserted, slide freely in the slots in the carriage, and permit it to be traversed without operating the base-plate. On the underside of the base-plate is a toothed rack K, which gears with a pinion mounted on the sleeve or arbor, coupled to the intermediate spindle F, by means of a rachet-coupling, comprising a ratchet-wheel mounted on the spindle F and a pawl pivoted to a disc-plate mounted on the sleeve—the pawl being pressed into engagement with the ratchet-disc by means of a spring, so that, when the coin is properly inserted, and the coin-carriage withdrawn by hand, the coin-rack sleeve is rotated, and with it the intermediate and screwed spindles or rods; but in returning the coin-carriage to its initial position, only the coin-rack sleeve is rotated. It will thus be seen that, as each successive coin is inserted, and the coin-carriage operated, the screwed spindle B, is rotated through a definite angle, which carries it forward axially through a corresponding space, and with it the index-rack C, which operates the index-pointer to indicate the quantity of gas to the credit of the purchaser.

The rotation of the unit-index spindle or arbor under the action of the measuring device, on the passage of the gas, rotates the worm-pinion on the screwed rod B, and gradually returns it and the index-rack C and pointer to their initial positions, unless further coins are inserted before the quantity paid for is exhausted. The screwed rod B and the worm-pinion are normally prevented from rotating by a counter-weighted pawl-lever L, engaging with a ratchet-pinion mounted on the spindle F; the pawl-lever being displaced by the inserted coin, which disengages the pawl, and permits the coin-slide to be withdrawn—the discharge of the coin again permitting the pawl-lever to resume its normal position of engagement with the ratchet-pinion. When the supply paid for is exhausted, the pointer indicates zero, and the screwed rod B is at the extremity of its traverse, as shown; so that the projecting end plate is withdrawn from underneath a weighted cam lever M (fig. 2), pivoted to a pin, which permits it to fall forwards into the path of the rotating arm or tangent N of the measuring-device spindle, and prevents its further rotation, and so cut off any further supply of gas until another coin is inserted.

In order to meet the requirements of the varying price of gas, a device is provided, comprising a circular disc mounted concentric with the rack-sleeve, and having formed in it a curved slot of the involute type, in which a stud for securing the coin-rack I works. Thus, on rotating the disc, the position of the rack varies, and the traverse of the coin-carriage is thereby regulated—a projecting arm on the rack acting as a stop to limit the traverse of the coin-carriage. A graduated drum or limb serves to indicate the quantity of gas per unit coin in any position of the disc. The drum is retained in any position by a tooth, held in engagement with a corresponding tooth in the drum, by the spring-lever operated from below.

Gas-Fired Retort-Benches.—Newton, H. E.; communicated from R. N. Oakman, of Greenfield, Mass., U.S.A. No. 22,096; Dec. 2, 1892.

This invention consists in "provision for heating retorts in which the carburetting medium is produced and fixed by means of 'producer' or 'generator' gas, which is more or less a waste product."

In carrying out the invention, use is made of old benches of retorts; and an arrangement of apparatus is adapted thereto, whereby the producer gas may be employed in heating the retorts for the purpose above named. The gas is supplied from a holder under pressure; and air to support combustion is also supplied under pressure—both gas and air being heated previous to their being injected into a closed combustion chamber, from suitable burners inserted in the fire-brick block with which the doorway is filled. The gas is heated in "serpentines" placed in flues situated below the retorts, and on opposite sides of the bench. The air is heated separately in a serpentine on the top of the bench, heated by the waste heat, which, issuing from the gas-heating flues, passes by special flues to the air-heater. The flames from the combustion chamber ascend between the retorts, and play upon and around the retorts, which thereby become heated to the proper temperature; and the waste heat then passes over and downwards, on the outer side of the retorts, to the gas-heating flues, and thence to the chimney or to the air-heater, as before mentioned.

Fig 1.

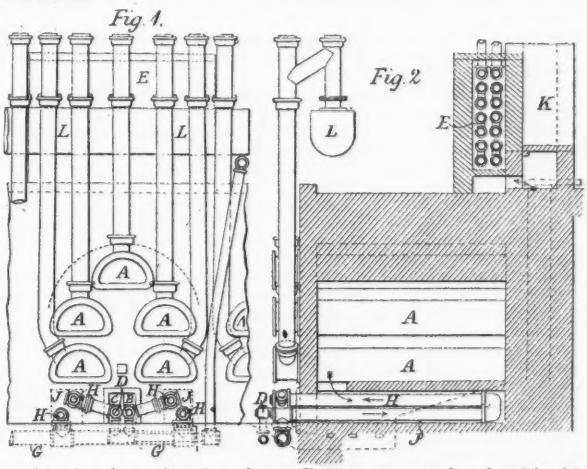


Fig. 2

Fig. 1 is a front elevation of an ordinary gas retort-bench with this invention applied thereto. Fig. 2 is a longitudinal sectional elevation of the bench. Fig. 3 [next page] is a plan (partly in section, and to a larger scale) of the top of the bench, and a vertical section, showing the arrangement of the gas-burners.

The retorts A are ordinary D-shape, and set in the usual way. B is the fire-place or furnace, which is closed (instead of with an ordinary door) by a fire-brick block C, in which the burners D are fixed in any convenient manner. At the back of the grate is a bridge, which is preferably laid dry; and on the grate are slabs, so that the fire-place by these means is made practically air-tight. E is an air-heater or serpentine, preferably placed on the top of the setting, and in connection with flues for carrying off the waste heat. This air-heater is connected with the burners D. The producer gas, under pressure, arrives by the pipe G; and after passing through the gas-heater H contained within the flues J, enters the burners D. The flues J are in connection with the retort-chamber of the bench by the

openings, and also with vertical flues. From these flues the waste heat may pass through the air-heater E, or direct to the chimney K. The burners D are of injector form—that is to say, the air-pipe is inside, and concentric with the gas-pipe; but both air and gas are supplied under pressure. The gas and air is fired in the closed fire-place; and the products of combustion, after doing their duty on the retort, will pass away to the air-heater and chimney—giving up their heat as they go for the purpose of heating both gas and air. L is the hydraulic main.

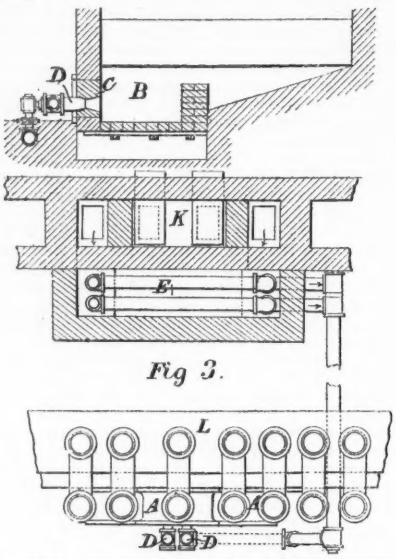


Fig 3.

When the retorts are used for carburetting water gas, says the patentee, the water gas and oil will be introduced into the retorts in any convenient manner; or the oil only may be introduced into the retort—the water gas being mixed with the oil vapour beyond the retorts.

Manufacture of Sulphate of Ammonia and Liquid Ammonia.—Dempster, R., of Newton Heath, Manchester. No. 22,602; Dec. 9, 1892.

These improvements have for their object "a more effective means of separating ammonia from ammoniacal liquor than has hitherto been obtained."

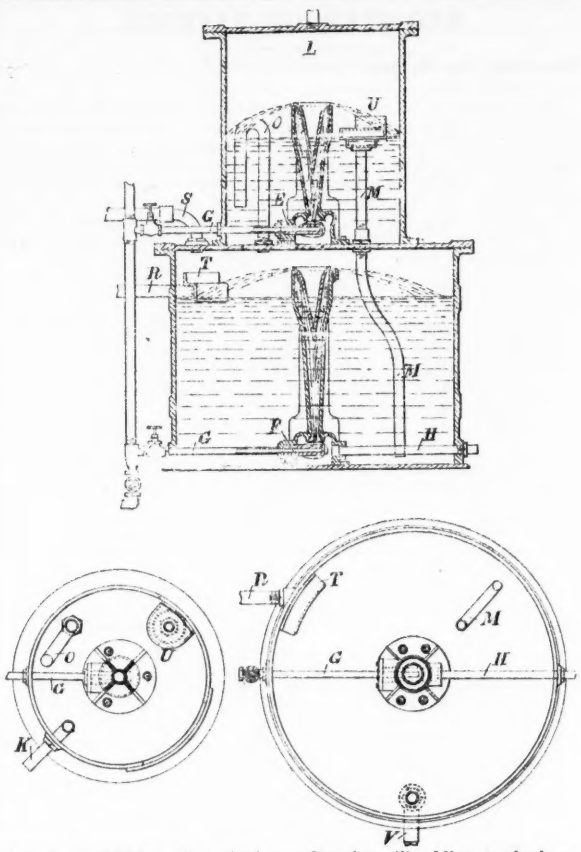
In apparatus for this purpose as at present for the most part employed, says the patentee, "the ammoniacal liquor, after passing through a heater, is caused to fall upon a series of trays placed one between another, and so arranged that, as the liquor in each reaches a certain depth, it overflows into the tray below. The heated liquor is thus enabled to offer a considerable evaporating area, so that the free ammonia therein may escape. Provision is made for the ammonia and the steam which has been introduced into the bottom of the still, to ascend through the whole series of trays; and at the top of the series, a pipe is provided, to conduct such ammonia to the saturator. As the liquid overflows from the last tray of the series, it is brought into contact with cream of lime, or other suitable alkaline solution; and afterwards the lime and liquor are passed through a second series of trays—the effect of the lime being to release the fixed ammonia, which is then passed into the saturator pipe, as before."

To render this process of ammonia separation more effective, and to accomplish his improvements, the patentee provides a casing or vessel divided into two compartments, or it may be two casings or vessels one above the other. Within each of the compartments, one or more vertical tubes are attached, into the lower end of which is introduced the nozzle of a steam-pipe, the upper ends being formed with a perforated bell, or otherwise, so as to eject, in a thin spray, any liquid forced through it. Or, in lieu of the bell, a plate or plates may be laterally mounted in connection with the top of the tube, so that the ejected liquor may escape therefrom in a film or films; or such plate or plates may be perforated. The bottom of each of these tubes may be perforated, or otherwise formed with passages, to allow the liquor to flow freely underneath; or a space is left between the bottom of such tube and the floor of its casing, so that, when steam is passed into the steam-pipes, the vertical tubes act after the manner of an ordinary steam-ejector, and the liquor is discharged from the bell, or over the plate or plates, in the form of a thin spray or film, which is most suitable for the ready evaporation or escape of the ammonia.

The action of the apparatus is as follows: The ammoniacal liquor, after leaving the heater, is led into the upper compartment or vessel, where it is continuously sprayed about the upper part of the vessel by the ejector-tube; the free ammonia escaping to the saturators by an outlet in the top of the apparatus. When the liquor reaches a certain height in the upper vessel, it overflows into the compartment beneath, where it mingles with lime in a creamy condition, which is conducted into the lower compartment by a separate pipe. Here the liquor and milk of lime are drawn by the steam-jet into the spray-tube, and discharged in a thin sheet, as in the former case; the action of the lime being to set free the fixed ammonia in the liquor, and the spraying of the whole enabling the ammonia to escape into the copper vessel, whence it passes to the saturators as described.

The top figure is a vertical section of the apparatus; the others are sectional plans of the upper and lower parts.

There are two compartments or vessels, within which are attached vertical tubes, provided with perforations or openings, to allow of the free passage of the liquor through them, and with deflecting-pieces, which spray out the liquid forced up the tubes into thin sheets. E F are nozzles (for forcing up the liquid), supplied with steam from the



pipes G; and H is a pipe, which supplies the milk of lime to the lower vessel. The ammoniacal liquor enters the top compartment (by preference at a low level), through the pipe K; and, being sprayed continuously by the steam-jet, gives off its free ammonia, which passes, by the pipe L, to the saturators. When the liquor reaches a certain height within the upper vessel, it overflows down the pipe M into the lower vessel, and is again sprayed along with the milk of lime, which is introduced through the pipe H; and the fixed ammonia thereby freed is conveyed through the bent pipe O into the upper vessel, and so, through the pipe L, to the saturators. R S are connections to a secondary apparatus, when required, which may be constructed of the ordinary character, or in accordance with the present improvements. In the latter case, liquor in the lower compartment overflows to it at a certain level, through the pipe R; and the further gas thereby released returns through the pipe S, to escape to the saturators, as before described. T U are baffle-plates, to prevent the spraying liquor from unduly escaping into the overflow-pipes R and M; and V is a sludge-pipe, for the removal of sediment from the lower vessel.

APPLICATIONS FOR LETTERS PATENT.

20,574.—Brooks, G. E., "Torches for lighting gas, and for other purposes." Oct. 31.

20,582.—Matton, F. V., "Pressure devices for retort-lids." Oct. 31.

20,628.—Welch, W., "Gas and other stoves for heating and ventilation purposes." Nov. 1.

20,673.—Slinn, W. H., and Lyst, F., "Gas, oil, and other engines." Nov. 1.

20,762.—Greene, T. A., and Walker, C. M., "Gas lighting." Nov. 2.

20,771.—Lister, A. A., and The Inventors' Exploitation and Development Company, Ltd., "Flat-flame and Argand gas-burners." Nov. 2.

20,894.—The Northern Counties Hydro-Oxygen Gas Company, Ltd., and Rayner, H. S., "Manufacture of oil gas." Nov. 3.

20,914.—Sharp, J., "Coin-freed or prepayment gas-meters." Nov. 4.

20,974.—Barriere, P., "Incandescing bodies or light emitters for use with gas or other lamps." Nov. 4.

20,993.—Chandler, S., jun., "Washing, purifying, and scrubbing gas." Nov. 4.

New Scrubbing Plant for the Harrogate Gas-Works.—The Harrogate Gas Company are about to make extensive alterations at their gas-works; and Messrs. R. Dempster and Sons, Limited, of Elland, have been entrusted with a contract for supplying two of their tower scrubbers, 10 feet in diameter and 50 feet high, with spiral staircase, machinery-rooms, &c., complete.

Water-Works and Banking, says the *Engineering Record*, were mixed up in a curious manner when Aaron Burr obtained, in 1798, a charter for a "water company" in New York City. But it enabled him also to engage in the East India trade and the banking business as well as supply water; and under this charter the Bank of the Manhattan Company of New York City must be, and is to-day, ready to supply to the city 450 gallons of water a minute from a well 19½ feet in diameter and 14 feet deep in Reade Street. The water is pumped from this well to a tank 40 feet in diameter and 35 feet deep; and the pumps are tried every day, to see that they are capable of fulfilling the conditions under which the Company retain their charter.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Saturday, Nov. 11.

(*Before Mr. Justice* NORTH.)

Leah and Another v. North British Water-Gas Syndicate, Limited.

This was a motion on behalf of four Directors of the defendant Company (who were also individual defendants in the action), resident in Scotland, to set aside an order made by Mr. Justice Wright in the vacation, allowing the issue of a concurrent writ and service on the defendants in Scotland, and to set aside service made in pursuance of such order. The main grounds on which the present application was brought forward were that the order of Mr. Justice Wright—an *ex parte* order—had been made on affidavits containing material statements which were not true, and that certain facts which ought to have been called to the attention of the Judge had been suppressed; also that the actual facts, as now brought to the knowledge of the Court, did not warrant the Court, in the exercise of its discretion, in allowing the defendants out of the jurisdiction to be brought to this country to meet the charges made against them. The action was started by two shareholders in the North British Water-Gas Syndicate, Limited, suing on behalf of themselves and all other members of the Syndicate, except seven Directors, who were made defendants. The Syndicate was nominally an English Company; but practically it was a Scotch one. Its registered office was in London, and there, in compliance with legal requirements, a duplicate register of members was kept. All the other papers of the Company were kept in Glasgow; and all meetings of Directors, and also of shareholders, have been held in that city. One of the defendant Directors was resident in England. The plaintiffs by affidavit alleged that the Company were wrongly carrying out the purchase of certain patent rights and business in the northern counties of England, though the scheme for doing so had been sanctioned by overwhelming majorities of members; and that the majorities had been obtained by the votes of interested members from interested motives. They also alleged that they (the plaintiffs) had been induced to take shares in consequence of false representations contained in a prospectus, issued both in England and in Scotland. The claim endorsed on the writ was of an extraordinary character. It asked, as against six of the seven individual defendants, for £145,000 damages for fraud, negligence, and breach of trust as Directors; for an injunction to restrain the carrying out of the purchase resolved on; for a declaration that the resolutions were invalid; that, if necessary, the sanction of the Court might be given to the use by the plaintiffs of the name of the Syndicate in an action against the British Water-Gas Syndicate, Limited, the vendor Company; that a meeting of the independent shareholders of the defendant Company might be ordered; and also for damages on their own behalf for alleged misrepresentation in the prospectus. The plaintiffs had commenced a former action, in the name of the defendant Syndicate, against the British Water-Gas Syndicate, the vendor Company, to set aside the proposed sale. On the 9th of August, an order was made in that action by Mr. Justice Kekewich, dismissing it, on the ground that the present plaintiffs had no right to use the name of the Syndicate; and their solicitors were ordered to pay the costs.

Mr. EVERITT, Q.C., and Mr. HUGH BOYD appeared for the applicants in support of the motion; Mr. SWINFEN EADY, Q.C., and Mr. MACASKIE, for the plaintiffs, opposed.

Justice NORTH said that, if the facts before him had been the same as those brought before Mr. Justice Wright, he could not have attempted to go behind the decision of Mr. Justice Wright, who had exercised his discretion on those facts. He could not hear the matter as an appeal from that learned Judge. The defendants were entitled to bring further evidence to show that the facts alleged were not true; and the Court could go into the question as to whether, on those further facts, the litigation should, in its discretion, be allowed to proceed in this country. Among the matters to be considered was whether the plaintiffs had any probable cause of action. His Lordship examined the evidence, showing that some of the material statements made in the affidavits before Mr. Justice Wright were untrue; and that material facts (including the proceedings before Mr. Justice Kekewich) had not been brought to the attention of the learned Judge. In using his discretion as to the main part of the action, in which the plaintiffs were suing on behalf of the members generally, he held that there was no reason why the defendants applying should be sued in this country. His Lordship did not consider, for the purpose of decision, the part of the relief personal to the plaintiffs. For this purpose, he said, the writ must be treated as a whole; and he allowed the application, with costs.

New Exhauster for the Newcastle (Staffs.) Gas-Works.—Messrs. R. Dempster and Sons, Limited, of Elland, have secured the contract for supplying a 30,000 cubic feet per hour reciprocating exhauster, for the Newcastle (Staffs.) Corporation Gas-Works.

Retford Corporation Gas Supply.—The annual report of the Retford Corporation Gas Department has just been issued. The Committee first express their sense of the great loss they have sustained by the death of their Chairman (Mr. B. Huntsman); and then, turning to the results of the year's working, state that there has been a considerable falling off in the receipts from residuals—tar having realized only half the price obtained in the previous year. Notwithstanding this, the gross profits are £1919, as against £1945. The amount standing to the credit of the net revenue is £744, after adding £500 to the reserve fund; making it altogether £4000, which, in pursuance of the instructions of the Council, has been transferred to the capital account. The Committee have made favourable arrangements for the coal supply for the present year; but this has been seriously interfered with by the coal strike, which has already caused some additional outlay in keeping up the supply, and will probably cause an extra expenditure of about £40 per week so long as it continues.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly General Meeting of this Association was held last Tuesday, at the City Terminus Hotel—Sir JULIAN GOLDSMID, Bart., M.P., in the chair.

The SECRETARY (Mr. R. S. Gardiner) read the notice calling the meeting, and also the following report of the Directors:—

The present half-yearly ordinary general meeting of the proprietors has been convened, in conformity with the Association's Acts of Parliament, for the purpose of receiving a report from the Directors upon the affairs of the Company and of declaring a dividend for the half year ended the 30th of June last.

The following summary shows the results of the Association's operations during that period: The quantity of gas made in the half year ended the 30th of June last was 4145 million cubic feet; the quantity made in the corresponding half year of 1892 was 4126 million cubic feet—being an increase of 19 millions, or at the rate of 0·45 per cent. The total number of lights on the 30th of June last amounted to 2,072,945; there being at that date 145,246 consumers on the books of the Association. At the close of the corresponding half year of 1892, the number of lights was 1,998,732, which gives an increase of 74,213, or at the rate of 3·81 per cent. The entire length of mains on the 30th of June last was 1692 miles; the length of mains laid on the 30th of June, 1892, was 1629 miles—an increase of 63 miles.

The stationary position of the Association's business during the past half year may be attributed to a falling off in the consumption of gas, chiefly at Amsterdam, Berlin, and Vienna, which was owing to the competition of the electric light, to the economy in the use of gas (due to the extensive adoption on the Continent of the Auer gas-burner), to the exceptional continuance of fine weather, and to the general depression of business.

The profit of the past half year is not equal to that of the corresponding half year of 1892, owing to a further decrease in the receipts for coke and tar, which has had the effect of increasing the net cost of coal to an abnormally high figure. The taxes levied upon the Association's revenue and property on the Continent are also becoming increasingly onerous.

The plant and mains at all the stations were maintained in a due state of efficiency. An old single-lift gasholder on the Bockenheim works at Frankfort has been replaced by a new treble-lift holder.

To meet the growth of the Company's business at Antwerp, considerable additions are being made to the retort power of the Berchem works at that station; and additional land has been purchased there in view of future extensions.

The Directors have sold land for which there was no further use at Aix-la-Chapelle, Ghent, Marseilles, and Toulouse.

The Directors beg to report that they have obtained a prolongation of the concession for the supply of gas to the town of Flushing until the year 1935; and their concession from the Commune of Zehlendorf—a suburb of Berlin—has also been extended until the year 1946.

The Directors have acquired the gas-works and concession for the lighting of the neighbouring towns of Corbeil and Essonnes, at an hour's distance from Paris.

The £350,000 3½ per cent. debenture stock, of which the issue was authorized by the extraordinary general meeting of the proprietors of the 2nd of May, 1893, was allotted on the 17th of the same month among the proprietors who had made application for the same. The total amount applied for was £648,830.

The Directors desire, in conclusion, to draw the attention of the proprietors to the accounts for the half year ended the 30th of June last. These have been duly audited; and from them the Directors have, in accordance with the provisions of the Companies Clauses Consolidation Act, prepared a scheme, showing the profit of the Association for the half year and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 5 per cent. for the half year ended the 30th of June last and a bonus of 1 per cent., both payable free of income-tax, on and after the 1st day of December next.

The CHAIRMAN, in moving the adoption of the report and accounts, congratulated the proprietors on the fact that they had been able to carry on the business of the Association so satisfactorily, notwithstanding the very serious depression of business and the arrest and stoppage of all improvement on the Continent generally. At the same time, he could not help feeling that there was a great deal which he ought to communicate to them with reference to the present state both of labour and of the gas industry. In respect to the condition of labour, he would like to point out two things which had arisen, and which must affect all gas companies, as they affected all business throughout the country. When disturbance arose in the conditions of supply of one of the first elements of life, such as coal, they found every business more or less affected, and every trade more or less injured. Although it was certain that the men had suffered greatly, it was equally certain that every sort of business which was affected by the strikes had suffered nearly as much. He thought it could not be forgotten that the strikes in England affected the Continent almost to the same extent as they did this country, for the reason that a very large part of the coal supply which went to the Continent came from England. It was because England had been the great centre of the coal supply of the world that what went on in this country affected the condition of every portion of the civilized world. If, too, strikes occurred in England, they generally found corresponding movements on the Continent; and, in some cases, the movement had even been initiated on the Continent, and then spread to England. Many of them had probably seen that there had been strikes in France and Belgium just as much as in England through the coal-workers in the country. Why he had ventured to point this matter out to them was, in the first place, that, as these strikes had affected business, they had prevented any increase in the consumption of gas; and, in the second place, as the strikes had affected prices, so also, from that point of view, they must touch the interest of gas companies everywhere. The proprietors had no doubt seen that last year, even before the strike began, The Gaslight and Coke Company paid 12 per cent., against 13 per cent. previously; and therefore he thought they could see, even without the disturbing element mentioned, what results might be arrived at in the course of a few years. This being so, and with several thousand pounds less profit in the past half year, it had been a very serious question with the Directors whether they ought to maintain the bonus, about which he had frequently spoken at their meetings. The old proprietors would, of course, remember that he had

repeatedly cautioned them, and told them that they did not consider more than 10 per cent.—5 per cent. each half year—to be the regular profit of the Company; and they had carefully maintained what they had given beyond as a bonus, because they had considered the possibility of not being able to pay the bonus, on account of fluctuations in trade, and other difficulties. Some of them had considered whether they ought even to pay the bonus—although they had earned it—on the present occasion; but, on the whole, they decided that they would continue it this time. He would, however, repeat the warning he had frequently uttered respecting the uncertainty of the future with regard to the bonus, in consequence of the strikes and difficulties in connection with coal. No chairman or director, however good, could settle what the future course of the market as to coal, and the future state of things as to strikes, would be. They would, however, pay what they fairly could; but if in the future they could not give a bonus, his colleagues and himself would have the pluck to come and tell them so. With regard to some other conditions of trade, the half year under review had been extraordinarily favourable to all of them as members of the public, because, in England and on the Continent alike, it had been unusual to have the immense amount of sunshine that had prevailed. This meant more heat, therefore more natural light, and consequently less gaslight; and, though it was good for them in their personal capacity as members of the civilized world, it had not been good for them in their capacity as shareholders in the Association. It was not, however, always so easy to reconcile the exact conditions under which they would desire to live. This had been one of the reasons which had affected the consumption of gas on the Continent, as he had been told it had also affected the consumption in England. Another matter had caused some diminution in the consumption of gas in Germany—viz., the adoption of the mid-European time. This practically made a difference of half-an-hour earlier in a town where it was adopted. People saw that the clock pointed to 11 or 10; and, being accustomed to go to bed at that time, they naturally did so. They also shut up their shops correspondingly earlier; and this led to a diminution in the consumption of gas. Neither his colleagues nor himself, however, could control such matters; and they were obliged to accept them as they found them. There was another matter which was also serious from a gas point of view. He believed there had been a general wave throughout the Continent and America, as there certainly had been in England, of arrest of business, stoppage of speculation, want of enterprise, and want of faith in securities good, bad, and indifferent. The result had been that business, even in their Company, had, to a certain extent, been affected; and they had been stationary. All he could say was—and he knew it from personal observation—that there had not been any time when the Directors had given more devotion to the service of the Association than in the past six months. He believed that six or seven of the whole Board had been travelling very frequently, and had taken long journeys in order personally to inspect their stations. Their staff had worked as well as before; and their business was in as sound a condition as any gas business could be expected to be in. He had told them of what he considered to be the good points of their business; and similarly he had now felt bound in honour to tell them of their weak points, over which the Directors had no control. He was sorry there should ever be a weak point with them; but, if he tried to conceal it, he would not be acting in that straightforward manner towards the proprietors which, he trusted, would ever be maintained between them and the Directors. One of the results of the general stagnation had been, as the report said, that coke had been much lower, and tar had been greatly reduced; hence one of the causes of their diminished profits. But, of course, all these results indicated the same thing—viz., the general disturbance in business relations; and, until business relations were re-established on a sounder footing, they could not look for any permanent improvement. All he could say on this subject, in conclusion, was that he trusted that before long the strikes might be terminated favourably, that business might be placed on a sounder footing, and that confidence might be restored. The very large number of applications which they received for their debenture stock showed that the shareholders knew that the Directors were doing their best to promote the welfare of the Company; and the fact also indicated that the public believed the business was soundly conducted, and that it was a good concern. He did not think it necessary for him to detain them any longer, except to tell them that they had among them on that occasion their Accountant (Mr. Walton), who had been upwards of 50 years in the service of the Company. This was an event that had only occurred in three cases—viz., Mr. L. G. Drory, who had for many years been their Chief Engineer in Berlin; Mr. Dudeum, their Chief Cashier in Vienna; and Mr. Walton, their Accountant. He thought the point was worthy of being recorded.

Mr. T. H. NEWTON seconded the resolution, which was unanimously adopted, without discussion.

On the motion of the CHAIRMAN, seconded by Mr. BASSETT, a dividend of 5 per cent. and a bonus of 1 per cent. on the £3,800,000 stock of the Association was declared for the half year, free of income-tax.

Votes of thanks to the Chairman and Directors, and to the staff, brought the meeting to a close.

The Birmingham Water Scheme.—A Special Sub-Committee of the Water Committee of the Birmingham Corporation has been appointed to visit the Elan watershed for the purpose of making suggestions in regard to the laying out of the workmen's village which is to be erected there. Although no formal start has been made with the general undertaking, about 100 men are already at work in one capacity or another. The stream is being cleared of boulders, and the land levelled.

New Water-Works at Oswestry.—The ceremony of inaugurating the extension of the water-works and the new municipal buildings at Oswestry was performed yesterday week by the Earl of Powis, lord of the manor, amid public rejoicings. The water-works, which have been constructed from plans prepared by Mr. Filliter, of Leeds, bring water to the town from Penygwely—a distance of about 6 miles. The storeage accommodation has been increased to 33 million gallons; and the new works have cost upwards of £19,000.

INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held last Wednesday, at Cannon Street Hotel—Sir E. A. INGLEFIELD, K.C.B., in the chair—for the purpose of submitting to the shareholders a resolution relative to the guarantee given by the Directors personally of the sum of £4000 to save the Company, and the subsequent allotment on payment at par of 3500 preference shares for such services.

The SOLICITOR (Mr. Francis) having read the agreement which was made on Sept. 14, 1891, between the Company of the first part and Sir E. A. Inglefield, Major C. Jones, and General Beresford of the second part.

The CHAIRMAN said the shareholders would recollect that at the ordinary general meetings in December, 1892, and June, 1893, the action of the Directors in guaranteeing the payment of the bills given for the purchase of the Italian patents, and subsequent allotment to them of 3500 preference shares on their paying for the same at par, was fully explained, and as fully approved and endorsed by the shareholders. The Board had since been advised it was necessary that what the shareholders then actually approved now required the legal and technical confirmation of an extraordinary general meeting. This was why the shareholders had been called together. He also mentioned that there had been some correspondence with reference to Dr. Falconer being represented at that meeting by his Solicitor; and, as the Directors had been informed that Dr. Falconer was too ill to be present, they had given permission to his Solicitor to attend. He then moved a resolution ratifying and confirming the agreement and the allotments made in pursuance thereof, on Feb. 16, 1893, of 3500 preference shares to Sir. E. Inglefield, Major Jones, and General Beresford, or their nominees.

Mr. JEFFERS seconded the motion.

Mr. STEVENS, on behalf of Dr. Falconer, said his client felt that the agreement which the Directors asked the shareholders to ratify was *ultra vires* and illegal. The powers under which the preference shares were issued were created by a special resolution passed in 1890, which provided that preference shares should be issued with this condition: That any person wanting to take up preference shares should also, to entitle him to do that, take up debentures. This resolution had never been altered; and he conceived that the issue of the preference shares referred to in the agreement was made in pursuance of the powers named in that resolution. Dr. Falconer protested against the resolution now before them; it being, in effect, an attempt to alter the special resolution passed in January, 1890.

General BERESFORD explained that the Directors, at the time the agreement was entered into, were quite prepared to take up the necessary debentures; but it would have been absurd to do so, seeing that there were only six months to run before the other debentures were to be paid off. They would have drawn 5 per cent. interest from the Company; and then have been paid back. Had not the Board made themselves responsible for the £4000, the Company would have been wrecked; and it was very painful to them, having done what they could for it, to have to defend themselves now from the action of a gentleman who had refused to help them.

Captain M'TAGGART and Mr. HAWES spoke in support of the resolution, which was afterwards carried.

DUNEDIN SUBURBAN GAS COMPANY, LIMITED.

The Third Annual Meeting of this Company was held last Tuesday, at the London Offices, East India Avenue, E.C.—Mr. F. DUTTON in the chair.

The notice convening the meeting having been read, the report and accounts, which were referred to in the JOURNAL for the 31st ult., were submitted.

The CHAIRMAN, in moving their adoption, said that, at the last meeting, he went pretty fully into the condition and future prospects of the Company; and he then explained to them that there were two forms in which they might effect some improved results. In the first place, they had at that time sent out a number of cooking and heating appliances. Unfortunately, however, they did not reach Dunedin until practically too late to be of any use during the summer of that year; and their Manager reported that, until the summer which was now approaching, there had been no real opportunity of testing how far he might be able to get them utilized by the consumers. In order to offer an inducement to their customers to burn gas for heating and cooking, they had substantially increased the rate of discount allowed for punctual payment for gas used for these purposes. The consumers had also been circularized; and this had been followed by a personal canvass. He mentioned that a large glass manufactory had been connected with the Company's mains; and there was some hope that, in the course of the year, they would be able to show from this source a substantial addition to the consumption. The other question he alluded to at the last meeting was the prospect of a contract with the Corporation of South Dunedin. The Board had had the matter continually before them; but they were eventually compelled to recognize that there was no possibility of their being able to procure the contract from the Corporation, who appeared to have a keen desire to retain it. There were other circumstances, too, which convinced the Board that it was quite impossible to attempt to compete with them with any advantage to the Company; and, therefore, they had abandoned it. Turning to the accounts, he said that, at the last meeting, the Directors expressed the hope that the result of the Company's operations during the then current year would enable them to wipe off the entire amount standing to the debit of the revenue account, and show a small sum to its credit. He was happy to say that they did not over-estimate the capabilities of their business; and that during the year they had written off the whole of the debit, and showed a sum of £119 to the good. He was afraid, however, they could not hold out any expectation that the accounts for this year would present any large improvement on those now before them; but, in this connection,

he mentioned that the number of consumers had grown from 566 at June 30, 1892, to 604 at the end of last June. In conclusion, he alluded to reports which the Directors had received as to the development of the suburban districts of Mornington and Caversham, which, he thought, they might fairly expect would result in extra business to the Company.

Mr. ALLAN CAMPBELL seconded the motion, which was agreed to.

The retiring Director (Mr. Campbell) and the Auditor (Mr. W. Stansfield) were re-elected; and a vote of thanks was afterwards passed to the Chairman and Directors.

A PROJECTED ELECTRIC LIGHTING SCHEME FOR FALMOUTH.

The Falmouth Town Council have been contemplating the introduction of electric lighting; and the Lighting Committee lately instructed Messrs. Veale and Co., Electrical Engineers, of St. Austell, to report on the matter. This was duly done; and their report was considered by the Council at a recent special meeting. The streets in the district submitted to the Engineers—altogether about a mile in length—are at present lit by 43 gas-lamps, placed at distances varying from 45 to about 80 yards apart, and having an aggregate power of 600 to 700 candles. The Engineers say that, assuming more brilliant illumination of these streets is desired, 20 arc lamps of 500-candle power each, and five 32-candle power incandescent lamps would appear to be quite sufficient, and would yield an aggregate light of 10,000 to 11,000 candles. For the production of this light, about 10-horse power would be required; and the lamps, including fixing, would probably cost about £350. If, on the other hand, incandescent lamps were employed, the 43 gas lights could be replaced by lamps varying from 32 to 500 candle power, at an approximate cost of £150 for lamps, fitting, and connections; and, assuming an average power of 150 candles, they would give a total of 8600-candle power. It is pointed out that this method requires, with lamps of very high efficiency, about 15-horse power; and that they will have to be replaced probably every 200 hours. The Engineers assume that it is not the intention of the Council to limit the supply to the public lamps, as the small number of lights on such a length of main would, they say, raise the cost to a prohibitive figure. They have therefore estimated for distributing over the district current equal to 2100 8-candle lamps of the efficiency usually employed, each requiring about 30 watts. The estimate provides for two dynamos of modern type, each equal to about 650 8-candle lamps; and also for steam-engines to drive them. But the Engineers remark that the very low consumption of fuel when gas-engines are employed, offers a great inducement to their use. It is assumed that light will only be supplied between dusk and midnight, and from 6 a.m. to 9 a.m. in the winter. When all-night lighting and power supply by day are considered desirable, a small engine and dynamo and a storeage battery will be required. The supply is to be on the low-pressure system. The estimated cost of the station, plant, and mains is £4566; but this provides mains of a capacity considerably above that of the other part of the plant. The total annual cost is put at £658. This includes a sum of £138 for coal; and the Engineers remark on this item that gas-engines using producer gas would supply the same power at less than half the amount mentioned. After full consideration of the report, the Council resolved—"That the Chairman and members of the Lighting Committee be thanked for the service they have rendered in obtaining so much valuable information in the matter of lighting Falmouth with electric light, and that they be invited to communicate with the Gas Company, or any person, with a view to obtaining further information on the subject." No doubt the Company will be very pleased to furnish information as to the cost of improved street lighting by gas, if increased illumination is what the Corporation require. But they will have to pay more for it than they do at present. Last year the total gas consumption by the public lamps, covering about eight miles, was only a trifle over 2 million cubic feet, which worked out, at the current price (3s. 6d. per 1000 cubic feet, with discount) to £307—not half the amount of the estimated annual cost for electric lighting.

Electric Lighting of Winchester.—The premium offered by the Corporation of Winchester for the best scheme submitted for the electric lighting of the city has, on the report of their Consulting Engineer (Mr. Morgan Williams), been awarded to the Brush Company. As our readers are aware, the city is lighted by oil-lamps.

The Failures of Electric Lighting in the City of London.—Our readers may remember that, at a recent meeting of the Commissioners of Sewers of the City of London, the Engineer (Mr. W. Haywood, M.Inst.C.E.) was instructed to prepare a report as to the number of failures of electric lighting, and the substitution of gas, which have lately taken place in the City. His report, covering the past six months, was presented at the meeting of the Commissioners last Tuesday. It stated that the total number of arc lamps in use was 475. The number of gas-lamps disused, but maintained ready for lighting, was 1219. The total number of failures of the electric light during the period in question was 301; the most serious failure being on May 7, when 42 lamps were not lighted until nine o'clock. The explanation given by the Company was that the switch was defective. On June 17, 65 lamps went out for a considerable period; but the gas was not lighted. The explanation given by the Company was that there was negligence on the part of the stoker at Wool Quay. On July 27, 96 lamps went out; and the reason given was the breaking of a belt. The 475 arc lamps, at a cost of £26 per annum each, gave a sum of £12,350. The length of streets lighted was 13 miles. The fines for these defects would be deducted from the next account of the Company. The information regarding these failures was received from the police force; and the returns were sent to the Company's office and filed in the Engineer's own office. The report was ordered to be printed and circulated.

WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the Offices, Marylebone Road, N.W.—Sir W. H. WYATT in the chair.

The SECRETARY (Mr. F. H. Wybroo) read the notice calling the meeting, and subsequently the report of the Auditors. This stated that, at Sept. 30, the cash balance at the bankers' amounted to £4076, less outstanding cheques £801. The investments of the reserve fund were as reported last half year; and the repairs and renewal fund also remained as before. The Company had on deposit at interest £125,000—namely, with the London and Westminster Bank, £35,000; the Union Bank, £30,000; the London and County Bank, £30,000; and the London Joint-Stock Bank, £30,000. The capital of the Company was the same as reported last half year—viz., £1,372,136; and the total expenditure had been £1,352,539, including £1598 expended in the half year under review. The revenue for the six months to Michaelmas last had been £124,407, showing an increase of £2391 on that of the corresponding period of last year. The water-rental during the six months had amounted to £108,564; and the balance to the credit of the dividend and interest account was £159,616.

The CHAIRMAN stated that they had had an unusually anxious time in the past half year. There had been a Royal Commission sitting on their affairs; and probably the shareholders had seen the substance of the report of the Commission, and how very satisfactorily the Companies had come through the inquiry. They had had an extraordinary period of drought, which was unprecedented in the history of the Company. A certain amount of difficulty had no doubt been experienced owing to this, although it was nothing that they could not get over, as they had shown. The constant system of supply had very much increased this difficulty. It was all very well to say that the constant supply was a good thing; but he doubted if it was such a very good thing even for the consumers, and it was not for the Company, on account of the waste that took place in connection with it. They might put a large number of inspectors on to prevent waste; but they could not do very much in the matter. They had also had lately a certain amount of anxiety about coal; but as far as they were concerned, that difficulty was now settled. In the report they referred to the good order and efficient condition of the works at the various stations; and they were able to do this not only on the faith of the report of the Engineer, but the Directors had personally satisfied themselves on the matter. Nothing had been allowed to go back in connection with the undertaking. He did not say that there were not some fresh works which were wanted, but all the existing plant was in the most excellent condition, and could not be improved upon. There had been a large number of new supplies, and a good many new constant supplies. As stated in the report, the Directors had decided to introduce a Bill in Parliament; and this was a very important point. This matter had been delayed for some years; for he had no hesitation in saying that they would have applied for the powers referred to in the report four or five years ago, had it not been that Parliament had been so harassing in regard to water companies. The report of the Royal Commission, however, was so satisfactory to the Companies that the Directors had decided to apply to Parliament next session. The Royal Commission, in their report, said: "We are strongly of opinion that the water as supplied to the consumers in London is of a very high standard of excellence and of purity, and that it is suitable in quality for all household purposes." That was stated in the face of the evidence given by the chief witnesses for the London County Council; and that being so, he thought it was very satisfactory indeed. The evidence of these witnesses could not be credited; their statements were too exaggerated. The Royal Commission had spoken about further storeage, &c.; and this was one of the matters upon which the Companies would have to expend money. However, what they themselves had in contemplation now was expenditure on their own works. It was very necessary—or, at least, very desirable—that they should have another storeage reservoir; and when he told them that this was likely to cost £200,000, they would understand that the expenditure contemplated involved a large sum of money. They had been "nibbling" at a piece of land for a long time; but had been afraid to do anything in the matter, in the position in which Parliament had put them. They thought, however, that the time had now arrived when they could apply to Parliament for a money Bill for this and other things. He did not know whether they would grant it; but he thought they would, or he did not see how London was to be supplied with water. However, they must take what they could get, although he should not think that they would now experience much difficulty. Of course, they would be opposed by the London County Council; but that they were prepared for. At the same time, the Council could not oppose the Company in the same way as they might have done had the Royal Commission reported against the Companies; and their opposition could not be very effectual, in face of such a report as that which had been given. The Board therefore thought that the Company had a very good chance of being successful in their application to Parliament. There were two things which were not mentioned in the Directors' report, because they had happened since it was written. They had made a contract with a sister Water Company for the purchase of a large reservoir, having a capacity of 6 million gallons. That Company had not much use for this reservoir; but it would be very advantageous for them. He knew it was an excellent sale for the other Company; and he hoped it was not a bad bargain for their Company. They had also been able to enter into a new contract for coal; but not at the same price as before, although the advance was not so great but what they would be able to meet it without difficulty. It was a great thing for them to know that they had made an arrangement for their coal for the next eighteen months. He concluded by moving—"That the report of the Directors to the proprietors this day, with the half-yearly accounts and the report of the Company's Auditors thereon, be severally received, confirmed, and entered on the minutes."

The DEPUTY-CHAIRMAN (Mr. J. Meyer) seconded the motion.

The CHAIRMAN, in answer to questions, said he feared that the issue of fresh capital would give no advantage to the proprietors, as Parliament would only allow them to raise such capital under the auction clauses,

or by tender. The shareholders could, of course, tender for the stock, or bid for it at auction, like anyone else; but they would not get any better chance than the outside public.

The resolution was carried unanimously; and a dividend was afterwards declared on the consolidated stock at the rate of 10 per cent. per annum for the half year, less income-tax.

Resolutions were subsequently passed thanking the Auditors for their careful examination of the accounts, and the Chairman and Directors for their attention to the business of the Company.

The CHAIRMAN, in acknowledging the last-mentioned vote, repeated that there had been a good deal of anxiety for them in the past half year; but he thought that they had been much cheered by the report of the Royal Commission, and also by the satisfactory state of the accounts. They expected a considerable amount of work in the current half year, as the Companies would have to meet and consider the recommendations of the Royal Commission, regarding the further works which the latter had recommended in their report. They would also have some anxiety in connection with their own Bill. As in the past, however, they would do their utmost to promote the prosperity of the Company; and he trusted their efforts might prove successful.

The proceedings then terminated.

THE CRISIS IN THE COAL TRADE.

The failure of the conference between the representatives of the Coalowners' and Miners' Federations, recorded in the JOURNAL last week, brought matters in connection with the "coal war" to a deadlock. Since that event, little has occurred to call for special notice, though a few things have to be recorded.

The past week opened with the publication, by the Secretary of the Coalowners' Federation (Mr. T. Ratcliffe Ellis), of a long letter reviewing the position, and offering an explanation of the owners' views upon the proposals they submitted for acceptance by the miners, and upon those put forward by the representatives of the latter. As Mr. Ellis's letter gives a succinct account of the origin and progress of the dispute, it may not be uninteresting at the present juncture to reproduce it practically in its entirety:—

In the month of June last, the coalowners asked for a reduction of wages. The rate then prevailing had been fixed in the year 1890; and between the years 1888 to 1890, there had been various advances, amounting in the whole to 40 per cent., upon the standard wage paid in 1888. Those advances were claimed by the miners, and conceded by the coalowners, on the ground that, as selling prices had increased, wages ought to be advanced. Since the year 1890, there had been a declining trade, resulting in a lessened demand for fuel, and a consequent reduction in the selling prices. The conditions upon which the increases were granted having entirely changed, the coalowners considered themselves justified in asking for a reduction in wages. The reduction they sought would have left the wages 15 per cent. above the standard of 1888. This application was accompanied by an offer to refer the whole question to open arbitration. If that offer had been accepted, there would have been no cessation of work; and the widespread distress, the injury to many industries, and the great loss to the coalowners resulting from this long stoppage would have been averted. The answer which was made to this application was that no reduction would be accepted, and that the offer of arbitration was declined.

Since that time there have been numerous meetings of coalowners and workmen respectively; and a strong appeal was made by the Mayors at the Sheffield conference to both parties to make some concession with the view of terminating the dispute. In deference to that appeal, and with a view of ending the deadlock, the coalowners at the Derby meeting reduced their claim from 25 per cent. to 15 per cent., which would have left the advances at 25 per cent. above the standard of 1888.

The approaches to a settlement made by the miners' representatives until this conference, have been as follows: That work should be resumed at the old rate of wages; that no advances should be asked for until the selling prices advanced to the 1890 level; and that, after the resumption of work, an endeavour would be made to try and devise a means of dealing with the wage question, to prevent a similar dislocation of trade in future. An attempt has been made to put an end to this unfortunate deadlock by the conference which has just been held.

I do not propose again to discuss the grounds upon which a reduction is asked for; and I desire only to mention two of the grounds upon which it is refused.

First, it has been stated, on behalf of the miners, that the wages paid prior to the stoppage did not enable them to obtain more than a "living wage;" and it has been suggested that on this ground, irrespective of the condition of trade or the ability of the employer to pay such wages, the rate of wages paid in the exceptionally good times of 1890 should be established as an irreducible minimum. In considering this part of the question, it is all-important that correct information should be available as to what the earnings of the miners prior to the stoppage really amounted to. In the *Yorkshire Post* of Oct. 11 last, Mr. Pickard is reported to have made the following statement at Barnsley on the previous day: "After trammers, fillers, and datallers are paid, this average will be very much lower. When it is borne in mind that this is a calculation based on a full week of six days, it is quite clear that a four days per week calculation would yield no more than about 16s. per week." On the other hand, several coalowners, in letters to the Press, have stated that the wages actually paid to the miners at their collieries largely exceeded the amount named by Mr. Pickard, and that the average wages, after making all deductions, were from 7s. to 8s. per day and upwards of £1 10s. per week per man. In a letter which I addressed to the Mayor of Sheffield, dated Oct. 20 last, I invited his Worship to suggest the names of six chartered accountants (Mr. Pickard to be invited to select one from that number), with the view that the gentlemen so selected should, under the direction of the Mayor of Sheffield, be requested to examine the books of three representative collieries in each district for the purpose of ascertaining the wages actually paid to the miners before the stoppage. As Mr. Pickard did not see his way to accept that offer, I have obtained returns from three representative collieries from each of the following districts: Lancashire, South Yorkshire, West Yorkshire, and North Derbyshire. They show: (1) The average amount per day paid to the miners during the year ending July last. (2) The average number of days per week the pits worked during that period. (3) The average wage per week. (4) The average percentage of absentees from work on the days when the pits were working. The following is the result: (1) Average amount earned per day by each collier, 7s. 4·82d. (2) Average number of days worked per week, 4·33. (3) Average amount per week earned by each collier, £1 12s. 0·4d. (4) Average percentage of absentees when pits were working, 10·36. The above amounts represent the net earnings of the miner, after deducting the wages paid to his drawer, filler, trammer or loader, and other outgoings incidental to his work.

Secondly, it has been suggested that the high prices of coal prevailing at the present time justify the resumption of work at the rate of wages existing prior to the stoppage, without any reduction. The coalowners regard the present prices as entirely artificial; and they believe that, within a very short time after work is generally resumed, these exceptionally high rates will rapidly fall. If, however, they should be at fault in this opinion, and the present demand is maintained, the miners would reap an immediate advantage on resuming work, by securing more regular employment; and, if the improvement should prove to be of a permanent character, due weight would be given to the fact when the matter was considered by the Conciliation Board.

The coalowners attended the conference with a sincere desire to arrange such terms as would end the present unfortunate deadlock, and in their proposals they had two objects in view—first, to obtain a settlement of the dispute by the establishment of a tribunal of conciliation; and, secondly, to arrange for an immediate resumption of work pending a settlement. As to the first, it was fully explained at the conference that the proposed composition of the tribunal was in the nature of a suggestion, and that the coalowners were quite prepared to consider any other scheme, provided there was a power within the Board to decide the question submitted to it, if conciliation failed. It will be seen, from a perusal of the suggestion, that the members of the Board should appoint the conciliators, if they could agree upon them; but, if they were unable to do so, then that some person of high official position should be invited to nominate three persons for the office, who should thereupon be appointed as members of the Board. With reference to the second object—the immediate resumption of work—it is only equitable that, whatever the decision might ultimately be, the terms upon which work is resumed should be such as would secure to each side the full benefit of that decision from the date when work is resumed. The coalowners can devise no better method than that which they have suggested—viz., that the amount in dispute should be placed week by week in neutral custody, and abide the decision of the conciliation tribunal. Unfortunately, this proposal did not find favour with the miners' representatives; and they suggested another. Before making any observations as to that, I desire very briefly to refer to an alternative proposal, suggested by the coalowners at a later period in the conference. A strong point was made by the miners' representatives that the men should return to work at the old rate of wages. The alternative proposal was made with a view of obtaining an early decision upon the question prior to work being resumed, and of ensuring as early a resumption of work as possible; but it was not accepted.

The proposal suggested on behalf of the miners was open to at least two most serious objections. In the first place, although a Board of Conciliation of some description was suggested, it was not intended that it should be empowered to act until after April 1, 1894; and, meanwhile, the coalowners would have had to pay the same rate of wages which were being paid prior to the stoppage. The coalowners feel strongly that these disputes should be disposed of by such a tribunal as they have named; but they see no reason whatever why they should not have the advantage of a decision as to the present dispute by that tribunal. Again, the tribunal, as proposed by the miners, would have limited powers. It would not be entitled to consider any reduction below the suggested minimum. The coalowners consider that its powers ought to be unfettered and absolute Lastly, it is impossible for the coalowners to agree to have cast upon them the responsibility of guaranteeing, under all conditions of trade, for the future, the payment of the minimum rate of wages suggested, which is 30 per cent. above the standard rate paid in 1888. They are not aware that any such responsibility has ever been imposed upon any other industry; and they feel that the consequences might be most injurious, not only to themselves, but to the miners.

The loss entailed upon the coalowners by this stoppage has been enormous, and the terrible distress which prevails is to them a matter of the deepest regret; but they feel that they have made an honest endeavour to bring it to an end.

The miners' representatives, although not apparently in favour of the proposal, promised to submit it to the miners. The coalowners believe that it affords the means of obtaining an equitable settlement of the dispute, and an opportunity of at once resuming work upon terms which are equally fair to both sides. The result of a refusal of this proposal will be to prolong this unfortunate struggle, and to cause still further and more widespread distress, and still greater losses to the coal trade and all other industries dependent upon coal—a result which everyone must deeply deplore. But, on the other hand, an acceptance of the proposals made by the miners' representatives would be to impose upon the coalowners conditions under which they could not carry on their business with any hope of success; and in many cases it would result in ruinous consequences. They earnestly hope that the proposals which they have made for a settlement, and with a view of ending a state of things which they regard with the deepest concern, will commend themselves to the public and to the miners as being both reasonable and just.

A largely-attended meeting of colliers was held at St. Helens on Monday last week, to consider the masters' latest offer for opening

their pits. This was put to the assembled men—about 2000 in number—and rejected with one dissentient. In the neighbourhood of Bolton, other meetings were held, when an equally strong opinion was expressed on the offer. Speaking at Barnsley, Mr. Pickard referred to the above letter of Mr. Ratcliffe Ellis, and said the coalowners had evidently felt their position to be untenable, and had tried to make the best of one of the worst bargains ever sought to be entered into by gentlemen owning some 80 or 90 million pounds' worth of property. The owners' manifesto tried to make out that the men had made no attempt at settlement; but if the men had made no attempt at settlement, then he was afraid there would be no settlement made in the future. The men were in no way responsible for the breakdown; and it now rested with the coalowners to say whether there should be peace or war. All he could say was, if the miners had to take a reduction, they would have to be starved into it. They would now have to wait and see whether the coalowner's pocket or the workman's stomach would last the longer. The policy of the coalowners was that the workmen must submit to such reductions as the state of trade might from time to time require. So long as coalowners clung to that cold-blooded economic idea, so long would they find human beings treated as wood and stone, and calculations made with this end in view. He hoped the terrible struggle would soon be brought to a close, and better feeling prevail. On the London Coal Exchange, there was a crowded and animated meeting. Prices generally were an advance on those of the previous Friday, since which day 41 coal-laden vessels had entered the Thames—a good proportion of which contained gas coal. With more offering, values were easier; sales being made at 16s. 9d. into barge.

On Tuesday morning, a circular, signed by the President and Secretary of the Miners' Federation, was issued to the various branches. After recapitulating the suggested terms of settlement, it concluded as follows: "We cannot advise you to accept the employers' terms for settling the dispute. We have been fighting for a living wage; and, before coming to any final vote, we strongly urge you to read to your members the verbatim report of the London conference." At a meeting of the Derbyshire Coalowners' Association, held at Chesterfield, it was decided to allow the miners at the Shipley Collieries to commence work at the old rate of wages, on the ground that the collieries were being wrecked owing to the presence of "gob" fires. The Derbyshire miners' Secretary (Mr. Haslam) subsequently addressed the men at a mass meeting, at which they resolved to return to work. One prominent member of the masters' Association said: "We have done what we can. We shall do no more, and will now wait until the men realize the foolhardiness of their action." He added, however, that he did not blame the men so much as Mr. Pickard; and that, if Mr. Pickard would be reasonable, the struggle would soon be ended. At Leigh, between 2000 and 3000 miners met in the Assembly-Rooms to hear reports from the delegates to the London conference; and it was unanimously resolved that the proposals of the masters be not entertained, and that the miner's delegates be instructed to bring out all the men now at work in the county.

Mass meetings of miners were held on Wednesday at Cannock, Chesterfield, Clay Cross, Eckington, and Staveley; and resolutions were passed to reject the masters' offer. A conference of Gladstonian members of Parliament was held at the National Liberal Club, under the presidency of Mr. T. P. O'Connor, M.P., and a resolution passed pledging the meeting to give financial and moral support to the miners, and condemning the conduct of the owners in proposing "obviously unacceptable terms." On the London Coal Exchange, there was great eagerness on the part of merchants to buy. Wallsends and house coal were advanced 2s. per ton, to 40s. and 38s.; while the lower sorts, which were reduced 4s. on the previous Saturday, were put up 5s. Gas coal sold easily at 18s. to 19s. per ton into barge; 20s. being occasionally made. Coke advanced 2s., to 17s. per twelve sacks.

The returns received up to Thursday by the Executive of the Miners' Federation from the various districts showed that the men were practically unanimous in rejecting the proposals of the coalowners. It was stated that in no district had a proposition been put in favour of accepting the owners' terms; but that, on the contrary, in every case the men had voted almost solidly in favour of returning to work only on the full wage, without deduction or conditions as to the future. A meeting of Cannock Chase coalowners was held at Birmingham, at which a resolution was passed thoroughly approving of the action taken by the federated owners. According to a report circulated by the Press Association, communications were passing between certain well-known representatives of the coalowners and of the miners, with a view to the proposal of terms which might possibly be mutually accepted as an early settlement of the dispute. It was stated that both parties showed a more conciliatory disposition than was displayed at the recent conference; and this fact encouraged the hope that the private negotiations might have a satisfactory result. The subject of the dispute in the coal trade was referred to by the Earl of Kimberley, in the course of his reply to the toast of "Her Majesty's Ministers" at the Lord Mayor's banquet. He said: "I am bound to say something about the internal condition of this country. Can anyone present forget the great coal dispute? Is not that one of the most calamitous things which has befallen this country for many a long year? I do not wish, nor am I competent, to say anything about the merits of the dispute. Her Majesty's Government deeply regret that no arrangement can be arrived at; and if they can in any way facilitate a settlement, nothing would give them greater pleasure. I do trust that both masters and men will not forget that, quite apart from the immediate suffering which, as we all know and regret, is caused by the present dispute, there is something behind which is far more serious. If such disputes should take so great an extension as this, and if they should constantly recur, I should feel great apprehension for the general trade of this country. We have strong competition to meet; and it may easily be that, while we are disputing at home, we are losing a large portion of the trade abroad; and that trade may never return. I will mention one single fact which I happened to see the other day in an account of our trade with India. Ten years ago, in iron and steel exports to India, we possessed nearly the whole trade. Last year we had only double the trade in iron which Belgium and Germany had; and in steel they had a large superiority over us. Is not that a warning, and one that should be taken? May it not happen that, while we are quarrelling here as to how the loaf should be divided, the loaf may depart from us, and there will be nothing at all left to divide? That is the most important moral to be drawn from this unhappy dispute." In the House of Commons, Sir A. Rollit moved for the appointment of a Hybrid Committee to inquire into the causes and consequences of the coal dispute, and to suggest whether it is advisable to substitute conciliation and arbitration for strikes and lock-outs, and, if so, what methods should be adopted to bring about this result; but the motion came on at too late an hour to allow of a vote being taken thereon.

Speaking at a meeting at Barnsley on Friday, Mr. Pickard stated that the Miners' Federation were still open to settle the dispute upon mutual terms—the men to have the old rate of wages for a specified period, and any new departure in wages to be settled by a Board of Conciliation, to be mutually agreed upon, with the corollary that there should be a minimum rate of wages. They were willing to resume work at the old rate, and to fight out the points of their suggested settlement after the Board was formed. They were not willing, and probably never would be, to allow outsiders to help to form a Board. When one was constituted, they would be agreeable to calling in a third party—call him chairman, with a casting vote, or umpire-chairman—who would have power to review and decide whenever the Board could not decide for themselves. If the owners wished to get out of the deadlock, they would seize this opportunity at once. The miners' agent for the Leigh district (Mr. R. Isherwood) received an intimation that the West Leigh Colliery Company's pits and the Brynnhall pits, near Garswood, would be started on Monday, the 13th, at the old rate of wages. About 1500 men are employed at the pits. The news caused intense satisfaction in the district, where 11,000 miners were out of work.

Last Saturday, the Council of the Yorkshire Miners' Association had a meeting at Barnsley, and resolved as follows: "That this meeting hereby affirms our former resolution with regard to arbitration on the question of wages, and therefore declines the offer of the coalowners' suggested terms of settlement." (2) "That all, as far as possible, work at the old rate of wages until April 1, 1894, and that a Board of Conciliation be formed to deal with the following questions: (*a*) The 30 per cent. as minimum rate of wages; (*b*) whether the difference in the suggested rate of wages—viz., 40 per cent. on the 1888 rate—shall be dealt with on the rates ruling prior to the stoppage, or from the time work is resumed until April 1, 1894." (3) "That this Council hereby authorizes our representatives to deal with the foregoing questions, both before conferences of the Federation and the coalowners, in order, if possible, to secure a settlement of this deadlock."

It was mentioned in the JOURNAL last week (p. 859) that the Colne Local Board had decided to advance the price of gas by 6d. per 1000 cubic feet. At their meeting last Wednesday, the alteration was fixed to take effect as from yesterday. It was stated that, owing to the increased cost of coal, the Board were losing £100 per week at the present selling price of gas, and that, if the charge were continued, the whole of the estimated profits from the undertaking would be exhausted by the end of the year, and would require an addition of 4d. in the pound to the district rate next year. At Nelson the purchase of coal sufficient for the manufacture of gas up to the end of the present month has cost the Corporation an extra sum of £2500, which is equal to a rate of 7d. in the pound. The Town Council instructed the Gas Committee to consider the advisability of advancing the charge for gas. The Gas Committee of the Rochdale Corporation have just been seriously considering a proposal to raise the price; but they have decided not to do so at present. This question will, however, have to be brought up again, unless there is a termination of the existing deadlock; and this will probably mean an advance. The Committee cannot supply gas at a loss. The Chairman of the Committee (Alderman Petrie) stated, at the last meeting of the Town Council, that the year's profits are nearly exhausted by the increased charges for coal. This fact, which was really then only surmised, has now been established by an investigation of the Committee's financial position. The borough exchequer will therefore receive very little, if any, aid from the gas undertaking on this year's working. The situation is further aggravated by a slight, but distinct, falling off in the consumption of gas. As to their ability to keep pace with the demand, the Committee are now almost relieved from anxiety; and only an unexpected prolongation of the crisis will again embarrass them. The present daily supply of coal more than suffices for their requirements; and they are beginning to stock the surplus against the extra demands of the winter. At the meeting of the Stalybridge Town Council on Thursday, the Chairman of the Gas Committee (Alderman Holt) announced that an increase in the price of gas was enevitable. The Committee had had to purchase 1500 or 1600 tons of coal outside the contracts, and had had to pay about 10s. per ton more than the contract prices.

Projected Amalgamation of the Croydon and Carshalton Gas Companies.—It is reported by a local paper that arrangements are in progress for the amalgamation of the Croydon and Carshalton Gas Companies, and that the terms have already been agreed upon.

The Powers and Obligations of the Thames Conservancy Board.—In the House of Commons on Monday last week, Mr. H. Lawson asked the President of the Board of Trade whether he was aware that the Royal Commission on the Metropolitan Water Supply had unanimously recommended that the powers and obligations of the Thames Conservancy Board should be increased, in order to prevent the pollution of the river above the intakes of the Water Companies, and that the Board had no revenue at present to utilize for this purpose and no power of raising it; and, if so, whether he would consent to the appointment of a Select Committee to inquire into the position and power of the Board, with a view to legislation next session. Sir F. Dixon-Hartland asked whether it would not be premature to consider the question of appointing a Select Committee until the Bill which the Thames Conservancy Board had agreed to introduce, altering its constitution and powers, was before Parliament. Mr. Mundella said the question of the constitution and powers of the Thames Conservancy Board was receiving careful consideration, with a view to early legislation thereon.

THE PROPOSED EXTENSIONS AT THE LEITH GAS-WORKS.

In March last year, Mr. F. T. C. Linton, the Engineer of the Leith Gas-Works, prepared, at the request of the Edinburgh and Leith Gas Commissioners, a report on those works, with a view to their extension; but consideration of the matter was deferred till this autumn. As mentioned by our Edinburgh Correspondent last week, the report came before the Commissioners on the 30th ult.; and it was in the following terms:—

The works as presently existing are capable, in the respective departments, of properly dealing with a maximum manufacture of gas per 24 hours, as undernoted: Carbonizing department, 2,250,000 cubic feet; condensers, 2,000,000 cubic feet; exhausters and boilers, 2,250,000 cubic feet; scrubber-washers, 3,000,000 cubic feet; purifiers, 2,000,000 cubic feet; station meters, 2,125,000 cubic feet; and gasholders, 2,750,000 cubic feet. The greatest quantity of gas manufactured per 24 hours during the past winter was 2,139,000 cubic feet. Consequently, in the condensing and purifying departments and in the meters, the limits of proper and economical working have been reached; while, in the carbonizing department and the exhausters and boilers, the margin would not suffice for more than a year or two. It would, therefore, have been necessary for the reporter to bring the subject before the Commissioners next year at any rate; but, in doing so, he would have had to point out that, in his opinion, it would not be desirable to make additions in the present area of the works. Owing to the limited space, any additions possible to be made could only serve for two or three years at the most; and they would not permit of the introduction of mechanical apparatus for the handling of the coal (now being rapidly adopted at all large works), by means of which the costs of the processes of manufacture have been greatly reduced.

There are in the Leith works three retort-houses, separated from each other; and additions could only be made in that department by placing retorts in a fourth house, also separated from the rest. For manual labour, this separation of the houses did not matter; but the application of machinery is only economically possible when the retort-benches are in a continuous line, having the coal-stores in the same house on each side of the bench, and railway lines running through the whole length of the house. The reporter would, therefore, have had to advise the Commissioners not to waste money on a mere temporary patching of the present works, but to face the question of erecting new ones, where mechanical processes of manufacture might be adopted, as a supplement to, and ultimately as a substitute for, the existing works at Edinburgh and Leith. It happens, however, that a piece of ground adjoining the Leith works, and having an area of about 1½ acres, is now in the market.* Were this secured, it would be possible so to re-arrange the Leith works as to make them available for a maximum manufacture of 5 million cubic feet of gas per 24 hours; being more than double their present capacity. It would also permit of the adoption of the latest and most approved method of mechanical apparatus for handling the coal; so that manual labour (except that for tending the machines) would be entirely dispensed with, from the time the coal is emptied from the truck till it drops, in the form of coke, into the coke-barrow.

Subjoined is a statement of the proposed alterations and additions, and of the probable cost:—

Retort-house, 400 feet long by 190 feet wide, having 512 retorts, 22 in. by 15 in. and 9 feet long, with Siemens's regenerative settings, stage-flooring, coal-stores for three weeks' maximum consumption, railway lines in house, foul mains, and all other fittings and connections, less mounting from the present house re-used (£2846)	£38,434
Apparatus and machinery for breaking, elevating, charging, and drawing 500 tons of coal per 24 hours	12,500
Additional condensers for 3 million feet of gas per 24 hours, with foundations, connections, bye-passes, &c.	2,985
Additional exhausters for 2¾ million cubic feet per 24 hours, and allowing for duplicate machinery	2,510
Additional boilers and steam-piping	1,843
Additional scrubber-washer for 2 million feet per 24 hours	1,200
Tanks and cisterns to contain residual products for three weeks at midwinter (about 450,000 gallons)	2,125
Additional purifiers for 3 million cubic feet per 24 hours	8,460
New station meters, &c.	3,875
New railway lines and connections	850
Tank locomotive	800
Two-lift gasholder and tank at Blandfield, to contain 1¼ million cubic feet of gas, and arranged for additional third lift	18,900
Total cost	£94,482

The scheme involves, no doubt, a large expenditure of money; but, if carried out, it would suffice to meet the increase of business for a number of years to come, at a cost which, for the additional powers of manufacture provided, is moderate. The quantity of gas manufactured at the Edinburgh works last year was 973,833,000 cubic feet; and at the Leith works, 399,924,000 cubic feet—representing a maximum manufacture per 24 hours of about 7,000,000 cubic feet. The Edinburgh works as at present are not, as a whole, capable of a greater daily manufacture than about 5,000,000 cubic feet; and in some departments they are much overtaxed at that. Were the proposed additions made at the Leith works, the manufacture could be equally divided between the two establishments—giving each about 3,500,000 cubic feet as the present maximum make per day. This would relieve the Edinburgh works of 1,500,000 cubic feet per day, and would leave this amount as surplus manufacturing power, and also the same surplus at the Leith works. The total make of gas in the last year of the Companies (1887-8) was 1,228,367,000 cubic feet. For 1890-91, it was 1,373,757,000 cubic feet; showing an increase in the three years of 145,390,000 cubic feet. The above surplus of manufacturing power of 3,000,000 cubic feet per 24 hours between the two works is equal to a manufacture of 600,000,000 cubic feet per annum; and, at the rate of increase from 1888 to 1891, it would be sufficient for about twelve years to come.

The adoption of the proposed additions at the Leith works would therefore suffice for as much as is reasonably desirable in the way of provision for the future, and would besides furnish the Commissioners with works equipped with the most approved apparatus for the economical production of gas. Wherever mechanical means have been adopted for breaking the coal and for charging it into the retorts and withdrawing it therefrom, a saving ranging from 1s. to 1s. 5d. per ton of coal carbonized has been effected. At the lower figure, and for the make of 5,000,000 cubic feet per day (representing the use of 100,000 tons of coal per annum) this would amount to £5000 per annum, and would more than meet the charge for interest on the capital outlay. There would also be a further considerable saving effected in conveying the coal from the sidings to the retort-houses, and in emptying the trucks, as well as in improved working results. The proposed scheme would not require to be carried out at once in its entirety, but would be given effect to as needed.

As already stated, the Commissioners resolved to apply to Parliament for power to extend the Leith works; but they deferred adopting the report until the necessary authority has been obtained, Lord Provost Russell stating that it was unwise to burden themselves with details when before a Parliamentary Committee. Mr. Linton was instructed to prepare ground plans, showing the extent of the work proposed.

* This has been since acquired by the Commissioners.

THE SHEFFIELD CORPORATION AND THE INCREASE IN THE PRICE OF GAS.

At the Meeting of the Sheffield City Council last Thursday, the Town Clerk read a letter from Mr. C. F. Bennett, of which the following is the principal portion:—

In consequence of the Directors of the Sheffield United Gaslight Company having decided to advance the price of gas 3d. per 1000 cubic feet, a meeting of a few large consumers was held at the Cutlers' Hall on Friday last [Nov. 3] to consider whether any action should be taken in the matter. While the legal right of the Company to make such an advance was fully recognized, it was unanimously felt that, considering the present serious depression in trade, a strong effort ought to be made to induce the Directors to reconsider their action; and it was thought that, if a deputation were formed consisting of two members from each of the following bodies—viz., the City Council, the Cutlers' Company, the Chamber of Commerce, the Federated Trades Council, and the United Tradesmen's Association—to wait upon the Directors, and urge the views of the consumers, they might be induced to continue to supply at the old rates. I was, therefore, instructed to ask if you will be willing to join in such a united deputation; and, if so, to kindly appoint two of your members to act thereon.

Mr. C. F. Bennett proposed that the letter be entered on the minutes, and that the Council join a deputation to the Directors of the Gas Company in reference to the increase in the price of gas, and that the Mayor and Mr. R. Styring be appointed representatives of the Council upon the deputation. He did not think it would be necessary to say anything in support of the resolution.

Mr. Wardley seconded the motion.

Alderman Clegg moved, as an amendment, that the letter be referred to the Parliamentary Powers Committee.

Alderman Bramley seconded the amendment.

Alderman Gainsford, as the only nominee Director present at the Company's meeting when the advance was agreed upon, said he knew, as the representative of the Council, he ought to have expressed some amount of dissent to the proposal; but he was unable to see on what grounds he was to oppose, and the same difficulty would occur to the deputation. Either the price of gas must be raised or the dividends on, and the market value of, the Company's shares must go down. The question therefore was, the Company being within their legal rights, whether they could expect them to accept less dividend and less market value for their property than they were legally and well entitled to.

Mr. Skelton said that, if the shares were held by the original shareholders, he would have little difficulty in agreeing with Mr. Bennett that the advance in the price of gas might have been deferred; but, when they considered how many of the shares were held by persons who were almost, if not entirely, dependent on the dividends for their maintenance, they should hesitate before asking the Company not to raise their charge for gas, when they were paying such enormous prices for coal, and their residuals had not been yielding on anything like an adequate scale to the extra cost of coal.

Mr. Bennett contended that referring the letter to the Parliamentary Committee meant that the matter would be allowed to hang over, and perhaps never receive the attention it otherwise would get. The Directors of the Company might draw more largely on the immense reserve fund they had at their disposal. He was informed on credible authority that the residuals in many cases had gone up 100 per cent., and that the additional prices the Company were receiving for them were quite sufficient to compensate for the extra price they had to pay for coal. He made this statement with all deference, because he might not be strictly correct; but there were points which could be laid before the Directors by a deputation.

Alderman Clegg remarked that he would be very glad if the Directors could see their way not to enforce the increase in the price of gas; but he was told that, during the last four years, the Company had dipped very largely into their reserve fund to pay the dividends, and during that four years various Corporations had raised their price. Birmingham had advanced it 2d.; Leeds, 4d.; Halifax, 3d.; Bolton, 2d.; Walsall, 3d.; Oldham, 4d.; Nottingham, 2d.; Blackburn, 2d.; Accrington, 5d.; Burnley, 3d.; Edinburgh, 3d.; and Glasgow, 3d. Several companies had also raised their prices, some as much as 7d., and none of them less than 3d. The best course would be to refer the matter to the Parliamentary Committee. The three members of the Council who were nominee Gas Directors could look after the interests of the town better than a deputation.

Mr. CARR supported the resolution, remarking that the ratepayers were suffering quite as much as the shareholders of the Company.

Mr. WARDLEY thought it looked very much as if gentlemen became members of the Council in the interests of monopolies rather than on behalf of the ratepayers. He hoped the resolution would be carried, because the adoption of the amendment would mean either that the matter would be shelved, or that it was believed the Parliamentary Committee consisted of the concentration of the wisdom of the Council, which was not his opinion.

Alderman CARTER considered they must look at the matter from a business point of view; and, as the deputation would simply get a snub, the matter should be referred to the Parliamentary Committee for consideration.

Mr. UTTLEY said his experience showed him that the three nominee Directors were powerless in any attempt they might make to alter the policy of the Gas Company. It would have been a graceful act on the part of the Company if they had tried to go on, say, for another three months, without raising the price.

Alderman LANGLEY said that, although he could not be present at the meeting of the Directors when it was decided to raise the price, he tried to get the step postponed for a month or two. In face of the existing commercial depression, the increase was a serious thing. The unproductive work now being done by the Company, the large capital that had been called, and would be called up during the next twelve or eighteen months for unproductive work that was absolutely necessary to meet the growing demands of the city, led him to the belief that it would be some time before the price was again reduced—that was, if the Directors and shareholders were determined to have their "pound of flesh."

The amendment was carried; 33 members voting for it, and 17 in opposition—10 abstaining from recording their votes.

THE INQUIRY INTO THE MANAGEMENT OF THE KEIGHLEY CORPORATION GAS-WORKS.

The Arbitrator's Award.

The award of the Arbitrator (Mr. J. Waugh, of Bradford) appointed to investigate the charges made against Mr. John Laycock, Manager of the Keighley Corporation Gas-Works, by a discharged foreman named Hall, particulars of which were given in the JOURNAL last week, was delivered on the 4th inst. The following is the text of the award:—

Whereas, by an agreement in writing dated the twelfth day of October, one thousand eight hundred and ninety-three, and made between John Hall, of No. 11, Alfred Street, Worth Village, in Keighley, in the said county, gas worker, of the one part, and John Laycock, of Keighley aforesaid, Gas Manager to the Keighley Corporation, of the other part, after reciting that the said John Hall wrote and caused to be published in a newspaper called the *Keighley News*, bearing date the twenty-second day of April, one thousand eight hundred and ninety-three, a letter bearing date the nineteenth of April, one thousand eight hundred and ninety-three, and headed "The Gas Strike," in which certain charges and accusations were made relating to or concerning the said John Laycock, and reflecting upon his conduct in the capacity of a servant and the Gas Manager of the Keighley Corporation, as in the said letter appeared, and particularly that, in reference to the use of cannel coal, a statement that he, the said John Hall, was prepared to prove that since the strike, March twenty-fifth, scores of tons of cannel had been used at the Keighley Gas-Works, and that it was the excessive use of the coal, coupled with the stoppage of the stoking-machines, that produced the difference in quality, and a statement that there were machines for pumping air at the gas-works that the Gas Committee of the Keighley Corporation were not aware of, and that without such machines air could be, and was during last winter, put into the gas in order to make up for the deficiency caused by using the stoking-machines; and that the said John Laycock having denied the truth of the statements, charges, and accusations in the said letter stated, and having called upon the said John Hall to withdraw the same, admit their falsity, and apologize for having made them, and the said John Hall, still alleging, as in the said letter stated, that he was prepared to prove the truth of the said statements, charges, and accusations, it had been agreed by and between the said parties thereto that an investigation and inquiry, in manner thereinafter mentioned, should be held, at which the said John Hall had undertaken and agreed to substantiate the statements, charges, and accusations in the said letter mentioned or referred to, to the satisfaction of the Referee agreed upon as thereinafter named, and that upon the substantiation or otherwise of the said matters by the said John Hall, such consequences should follow and attend the issue thereof as were thereinafter expressed. It was thereby agreed, by and between the parties thereto respectively, that I should be the person to make and hold the said investigation and inquiry, and to whose satisfaction the substantiation or otherwise of the statements, charges, and accusations mentioned or implied in the said letter should be referred, and that my report, award, and determination, in writing, as to the substantiation or otherwise, by the said John Hall, of the said matters so referred to me, should be final and conclusive when made, and binding upon the parties thereto; and that my report, award, and determination, in writing, should be ready to be delivered to either party on or before the first day of December next; and that either of the parties should be at liberty to give evidence himself or to call before me such witnesses as he might think proper; and that if and in case the said John Hall, having attended the said investigation and inquiry, should fail to substantiate and prove the said statements, charges, and accusations to my satisfaction, then the said John Hall undertook and agreed with the said John Laycock that he, the said John Hall, would thereon forthwith make, sign, and publish in the newspaper called the *Keighley News*, and otherwise publish or cause to be published by posters or otherwise, as the said John Laycock might require, a full and complete withdrawal of the statements, charges, and accusations so remaining unsubstantiated as aforesaid, admitting therein their falsity, and apologizing for having made them, and would also, when called upon so to do, pay unto the said John Laycock all his, the said John Laycock's, and his Solicitor's costs, charges, and expenses of and incidental to the correspondence relating to the matters therein referred to, of the preparation and completion thereof, as well as his and his witnesses' and the Referee's costs, charges, and expenses of and incidental to the investigation and inquiry thereby agreed to and the finding and report thereon. Now know ye that I, the said John Waugh, having made and held the said investigation and inquiry under and in pursuance of the said agreement, and having heard and duly considered all the allegations and evidence of the said parties and of such witnesses as they have respectively thought proper to call before me touching the premises, do make and publish my report, award, and determination in writing of and concerning the same in manner following (that is to say): I find, report, award, and determine that the said John Hall, having attended the said investigation and inquiry, has failed to substantiate and prove the said statements, charges, and accusations to my satisfaction.

THE GAS, ELECTRIC LIGHTING, AND WATER UNDERTAKINGS OF THE HUDDERSFIELD CORPORATION.

The retiring Mayor of Huddersfield (Alderman R. Hirst) delivered to the members of the Town Council last Thursday the customary address on the work of the past year. We make the following extracts therefrom in reference to those departments of the Corporation in which our readers are most interested.

The past has been a year of considerable activity with the gas department of the Corporation; and financially it has proved equal to the task allotted to it with regard to its contribution to the borough fund. An increase of 20,890,000 cubic feet, or 4 per cent., has taken place in the production of gas, which necessitated the carbonization of 2969 tons of coal more than in the previous year. The weight of coal and cannel carbonized during the year, as compared with the previous year, has been as follows: 1892—Coal, 32,184 tons; cannel, 16,417 tons; total, 48,601 tons. 1893—Coal, 31,706 tons; cannel, 19,864 tons; total, 51,570 tons. There are now 18,340 meters in use, or an increase of 290 consumers for the year. Very considerable structural alterations and additions have been carried out during the summer, some of which have already been completed and put to work. New carbonizing and automatic coal-handling plant, consisting of 20 settings of nine 15-feet inclined retorts, has been put into successful operation. It is capable of dealing with 180 tons of coal per day of 24 hours. New purifying plant, consisting of some of the largest apparatus in the world, has been erected upon the No. 1 or Leeds Road section of the works; and it will be ready for the purification of gas this winter. A new bridge of 61 feet span has been erected across the canal, which has also been utilized as a gas-main, consisting of a four-way tube, by means of which the gas is conducted from the new exhausters on the east side of the canal to the purifying plant on the west side, and after purification back again to the holders. A new station meter, capable of registering 3 million cubic feet of gas per day, has been erected and coupled to the mains communicating with the new purifying plant. The oxygen plant, erected under Brin's patents, has been in successful operation for some months past; and a portion of the production is employed in the purification of the ordinary coal gas. The hydro-oxy gas process has also been successfully put to work upon the No. 3 section of the works; and a total of 600,000 cubic feet of the gas has been mixed with the coal gas during the past two months—resulting in a marked improvement in the illuminating power of the gas supplied to the public. The coal trade dispute has very seriously affected this department of the Corporation, and still promises to give considerable trouble and anxiety to the Gas Committee. At the commencement of the strike, there was on the works a stock of coal equal to three months' consumption. This, however, has proved to be insufficient to carry us through the trouble; the supplies now being supplemented by deliveries from the North and the few local collieries that have commenced working. Some 14,900 tons of coal will be required to meet our demands up to Christmas. The dispute has already cost the department upwards of £3500. At the urgent request of the inhabitants of Netherton, South Crosland, &c., the Committee have decided to extend the gas-mains to this district, which is part of our area of supply as scheduled in the Huddersfield Gas Act. It is also proposed to introduce the "penny-in-the-slot" meter in this area.

The electric lighting station was officially opened, and the supply of energy commenced, on the 29th of July. The number of consumers then connected was 33, or equivalent to 2200 8-candle lamps. The number of consumers now connected is 84, equivalent to 6800 8-candle lamps; and many more premises are being fitted up, and will immediately require connecting with the supply mains. The total length of conduit laid for high-tension mains, is 12,000 yards, into which 5420 yards of cable have been drawn. The total length of low-tension mains laid is 5305 yards. The number of junction boxes fixed is 127. The generating plant at the station is being increased by the addition of one engine and alternator, capable of supplying 6600 8-candle lamps, which, with the existing machinery, will be ample to meet all demands during the coming winter.

With regard to the Water Department, the Longwood upper reservoir has been repaired; the Wessenden old reservoir bye-wash has been widened and repaired; and the Blackmoorfoot reservoir has been maintained in good order. The quantity of water in store in the Blackmoorfoot reservoir on the 30th of October was 232 million gallons, as compared with 634 million gallons at the corresponding time last year. The lowest depth to which water has been drawn from this reservoir was on the 23rd of September, when it was 23 ft. 5 in. below the top—this being the lowest depth since it was filled in 1876. The renewal of mains during the year has been 952 yards, as compared with 924 yards last year; and the extension of mains has been 11,468 yards, as compared with 6045 yards. The quantity

of water supplied through meters has been: Inside the borough, 421,526,000 gallons; outside, 63,649,000 gallons; or a total of 485,175,000 gallons, as compared with 481,356,000 gallons for the previous 13 months. The population supplied is: Inside the borough, 107,825; outside, 36,100; or a total of 143,925, as compared with 140,890 last year. The net income for water for the 13 months to the end of March, 1893, was £51,373; and the profit on the department was £6099.

DUBLIN CORPORATION WATER SUPPLY.

The Present Position—Suggested Independent Supply for the Out Townships—The Waste of Water.

At the Monthly Meeting of the Dublin City Council yesterday week, a statement was made by the Lord Mayor (the Right Hon. James Shanks) respecting the position of affairs in connection with the water supply. He remarked that one of the local papers had that morning published a number of questions regarding the matter. It was admitted that, on the south side of the city, the supply from the Grand Canal was satisfactory; but, as to the north side, it was asked, if the Vartry supply should cease, where was water to be found. Now, he understood from the Engineer (Mr. Spencer Harty) that the Vartry would not cease to flow in that district for 30 days at least at the present rate of consumption, even if no rain fell, and that was a very unlikely condition of affairs. Then the pipes for conveying a supply from the eighth lock of the Royal Canal were being delivered and laid as rapidly as possible; and it was hoped that the work would be finished in a month. There was every reason to anticipate that, with some slight inconvenience, there would be nothing in the nature of a famine of wholesome water. He had not been in accord for some years with the Water Committee in certain respects. Three years ago, he urged the necessity for a proper inspection to prevent the waste of water such as existed in some large cities like Liverpool, which had brought down the supply to a considerable extent—in fact, down to 24 gallons per head per day; while in Dublin it was above 40 gallons per head. There should be some way of testing what was used for extraneous purposes; and he thought it was the duty of the Water Committee to apply some system of thorough waste-water inspection. He believed, if this were done, no such acute difficulty would have arisen; and it would also tend to allay public feeling. Mr. J. A. Walker, the Chairman of the Water Committee, supplemented the Lord Mayor's remarks by stating that he believed he was correct in saying that they had turned the corner. In a short time, he trusted, they would be able to extend the hours in which the intermittent supply was being given. What, however, they had to do was to look forward to the future; and he ventured to say their first business ought to be to make one additional storeage reservoir, either in the immediate neighbourhood, or between the reservoir and Bray. He believed there would be no necessity to go out as far as Roundwood. He thought it would be their duty to face this difficulty without delay; and he was satisfied that, if they did take up the question now, the citizens would not hesitate to furnish them with the necessary funds to carry out the work. Alderman Dillon, alluding to the system of waste-water inspection, observed that the people of Dublin seemed to have been under the impression that the Vartry supply was inexhaustible. Now, however, that they had seen this was not so, he hoped those who had been in the habit of using the water so lavishly would exercise great care and caution in the future. Replying to Mr. Maguire, who inquired, if the Gallonstown Water-Works were purchased by the Corporation, whether they would be under their complete control, Alderman Dillon said they would be their absolute property.

In the early part of the week, rain fell at Roundwood; but it only affected the level of the reservoir to a very slight extent. On Tuesday, a new steam fire-engine was set to work to pump water from the Bray river into the reservoir. Working at its full power, it will pump 1 million gallons a day; but this will only represent about one-third of the drain on the reservoir. Towards the end of the week, it was noticed that the water was slowly but steadily rising. The ont-townships have been recently considering the advisability of procuring an independent supply. On Monday, the Kingstown Commissioners passed a number of resolutions, declaring that it was expedient to obtain powers from Parliament to provide for the use of the inhabitants of the district a good and sufficient supply of water, and agreeing to hold a special meeting on the 18th inst. to discuss the question of promoting a Bill. The Bray Commissioners have authorized their Clerk to advertise for tenders for filtering and pumping 140,000 gallons of water per day from the "mill-race" into the township mains; but, at a subsequent meeting, a letter was read from the Secretary of the Corporation Water Committee, in which it was stated that the arrangements they were making would secure the Vartry water for Bray for a very lengthened period. Some correspondence was also read at a meeting of the Pembroke Commissioners, which, it was stated, had led to the Corporation undertaking to give the townships a continuous supply of filtered water from the Grand Canal, in lieu of an intermittent supply from the Vartry. Some remarks were made in the course of the proceedings by Sir George Moyers, who expressed the opinion that it would be quite six months before they would be able to again obtain a supply from Vartry; and he therefore thought they should join with Blackrock and Kingstown, or Blackrock alone, in providing a permanent independent supply.

The references which have been made during the present crisis to the great waste of water in the city has drawn from Mr. W. Hope, of the Palatine Engineering Company, Limited, a letter, in which he calls the attention of the citizens to the usefulness of the Deacon meter in detecting leakage and waste. He supports his statements by giving a list of towns and a number of figures, showing what has been achieved by the adoption of the meter. At Bath, the consumption in 1885 was 47·70 gallons per head per day; and this was reduced in 1890 to 21 gallons, or an annual saving of 215,315,000 gallons. The similar figures for Birkenhead were: 1882, 25·32 gallons; 1890, 17·10 gallons—an annual saving of 278,868,760 gallons. Carlisle, 1877, 42·56 gallons; 1890, 18·80 gallons, or an annual saving of 364,240,800 gallons. Gloucester, 1883, 32 gallons; 1891, 15 to 16 gallons, or an annual saving of 140,442,000 gallons. Lambeth, 1880, 33 gallons; 1890 18·34 gallons, or an annual saving of 1,858,437,235 gallons. Liverpool 1873, 24·25 gallons; 1890, 16 gallons, or an annual saving of 1,751,498,000 gallons. The supply at Portsmouth was reduced from 35 gallons to 19·47 gallons, or a saving of 630,898,485 gallons; and at Leamington from 24 to 16 gallons, or a saving of 66,567,240 gallons. The net annual monetary saving to the towns, assuming the water worth 6d. per 1000 gallons, and charging interest and depreciation at 8 per cent., is put down as follows: Bath, £4730; Birkenhead, £6253; Carlisle, £8926; Gloucester, £3162; Lambeth, £43,591; Liverpool, £37,672; and Leamington, £1522. Mr. Hope says that it is impossible to assign to the water saved a uniform value per 1000 gallons; but in this country a new supply can rarely be obtained for less than 6d., and commonly costs 7d. to 9d. per 1000 gallons. It will be observed from the foregoing figures that the highest rate of supply was 21 gallons per head at Bath; while in Dublin, in normal times, when the service was constant, the ordinary rate of consumption of Vartry water was something like 45 gallons per head per day. This, he points out, is a preposterous state of things; and fully two-thirds of this water actually never reached the consumers, but was lost through innumerable leaks and bursts. If Dublin had resolutely dealt with its leakage as other towns are doing, he believes there would have been an absolute abundance of water all through the dry summer.

A Caution to Users of Prepayment Meters.—At the South-Western Police Court last Thursday, a poorly-clad woman applied for advice. She stated that she had in use a "penny-in-the-slot" gas-meter, which had been placed in the area of her house. Someone had been to the meter, and taken therefrom 7s. 6d. in coppers; and she wished to know if the Gas Company could claim the payment of this amount again. Mr. Plowden told her she was liable to the Company for all gas supplied; and he advised her to call at their offices, and see if she could not arrange matters.

Curious Explosion at the Dublin Gas-Works.—An explosion of a rather serious nature occurred at the Ringsend gas-works at Dublin early on the morning of Sunday, the 5th inst. The cause of the accident is not very clear. It is stated that some tar got ignited in a chimney; and that the flames communicated with the gas in the new scrubbing apparatus. An explosion immediately ensued, the noise of which was heard a great distance away. A large patch, several square yards in extent, was blown from the side of the scrubber; and a considerable quantity of coke was thrown out. Fortunately, no one was injured.

A Disputed Gas Account.—At the Westminster County Court, last Thursday, before Mr. J. Lumley-Smith, Q.C., Mr. Leclour was summoned by The Gaslight and Coke Company for £13 7s. 6d. for gas supplied and meter-rent. The plaintiff's case was that the defendant signed a contract for the supply of gas to No. 55, Sandringham Road, Dalston; and that from September to March last gas was consumed to the amount of 89,400 cubic feet, which, with two quarters' meter-rent, came to the sum claimed. A complaint being made as to the account, the meter was removed and tested; and it was found to be correct. Witnesses were called to prove these facts. The defence was that Mr. Leclour did not reside at the house in question, the tenant of which was Mr. Dorinsky; and it was argued that, as the Company could not supply anyone but the owner or occupier of premises, defendant was not liable, as he was only the guarantor. His Honour pointed out that, though the Company must, under their Act, supply owners or occupiers, it did not follow that they could not supply anyone else. A witness stated that Mr. Dorinsky came to England, and some friends resolved to furnish a house for him; and defendant became liable for the gas as his share of the business. It was understood, however, that Mr. Dorinsky was to pay for it out of his salary as clergyman at a synagogue. His Honour said the meter was *primâ facie* evidence of the quantity of gas consumed; and there must be judgment for the plaintiffs for the amount claimed, with costs.

The Cost of Gas and Electric Lighting in the City of London.—At the meeting of the Commissioners of Sewers of the City of London last Tuesday, Mr. Johnston moved—"That it is expedient that Crutched Friars be lighted by electricity; and that it be referred to the Streets Committee to carry out." He said that, in consequence of what was stated at the last Court to the effect that Crutched Friars was not included in the list of the main thoroughfares, he had consulted the Engineer (Mr. W. Haywood, M.Inst.C.E.), who had confirmed this opinion. But although it was not scheduled as one of the main thoroughfares, it was very necessary that a street which was so greatly used by all kinds of traffic should be thoroughly lighted, which was not the case at the present time. Mr. Williamson having seconded the motion, Mr. C. T. Harris expressed a hope that the street in question would be lighted by arc lamps. [Mr. Johnston: Oh, certainly.] He preferred also that some statement should be furnished to the Court on the question of cost. He was not sure that the electric light would prove the most effective means in so dark a thoroughfare, where there were few shops to assist in lighting the street. The reason why London Bridge was not lighted by electricity was because the dark shadows thrown by the light and the absence of supplemental radiance from shops interfered with the traffic. He would prefer, therefore, and would move, as an amendment, that the question should be referred to the Streets Committee to consider. With regard to the cost of lighting the eastern district of the City, he found it was nearly 20 per cent. in advance of that for the main thoroughfares. In the eastern district, there were 233 arc lights, which, at £26 per annum, cost £6058. Adding to this the cost of maintaining disused gas-lamps—about £450—the total would be £6500. The previous cost of lighting by gas the whole (three districts) of the City with 1730 lamps was £5550. To light the district by electricity, thus cost £1000 in excess of the expenditure required to light the whole of the City by gas. And yet they were told that the cost of the new light would not be more than double that of gas, while it was actually three-and-a-half times the cost in the eastern district. Mr. Johnston said he was prepared to accept Mr. Harris's suggestion.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Intimation has been made by the Falkirk Joint-Stock Gas Company, that they are about to promote a Bill in Parliament, in which very extensive powers are asked. It is proposed to wind up the present Company, which is in the form of a co-partnery; and to incorporate the shareholders, and others, in a limited liability Company. It is also proposed to purchase more than 7 acres of land in Thornhill Road, which belongs to the North British Railway Company, and which is at present occupied as a brickworks, for the extension or transference of the Company's works. There is also a proposal to take power to open up streets, which may lead to opposition on the part of the Corporation, unless terms can be agreed on before. There is just a possibility, too, of residents adjoining the new site objecting to the erection of a gas-works in their neighbourhood. It is very likely that the Town Council will be moved to consider the advisability of taking over the Company's undertaking before the extended powers are obtained. There will probably, whichever way the matter goes, be a good deal heard of Falkirk in the next few months.

Glasgow is to-day living under the shadow of a new terror. The two systems of lighting—gas and electricity—not content with the competition above ground which is legitimate to them, have taken to conflict underground, to the alarm, but happily not as yet to the injury, of the lieges. Two occurrences have taken place this week—one on Thursday, and the other yesterday. In Glasgow, the electric lighting mains are copper strip, laid in cast-iron culverts, which are intended to be water-tight. They do not appear to be gas-tight, neither do the gas-pipes, in some places. At six o'clock on Thursday night, gas which had accumulated in the electric light culvert was fired at the corner of Mains Street and St. Vincent Street; and the resulting explosion displaced about 6 or 7 yards of adjacent pavement. Little notice seemed to be taken of the incident. At half-past ten next forenoon, however, a more serious explosion occurred, at the corner of Bath Street and Wellington Street. The cover of a manhole there was first observed to rise in the air; and then followed a succession of sharp, loud noises, simultaneous with which about 60 feet of the pavement on the north side of Bath Street was thrown up. There was great alarm in the neighbourhood; but the damage was confined to the electric lighting plant and the pavement. Nearly all along the distance affected, the covering of the copper strips was broken into splinters, and the copper itself was damaged. Regarding the accident, one newspaper says that "the gas is supposed to have been accumulating for some time; and the heat from the electric wires is believed to have caused the explosion." That, of course, is the explanation, though there must have been more than mere "heat." Whatever it was, there must have been a defect in the main. Mr. Arnot, the Electric Lighting Engineer, admits that the cables must have been sparking; but he goes further, and says that it was the gas which was the cause of the explosions. That is unkind, because no matter how much gas there might have been in the culvert, there would have been no explosion unless there had been fire. On the other hand, no matter how much fire there had been, there would have been no explosion if there had been no leak of gas. The fact is that both systems were faulty; and the question for the citizens of Glasgow—and for those of other cities—is not, so long as there are no damages to pay, which is to blame, but rather how similar explosions may be prevented. There always will be leakage of gas from mains; and there always will be defects in electric cables. A subsidence of the ground which would lead to a fracture in a gas-main, would also damage an electric cable; and so, while the two exist side by side under our streets, there will be danger, unless means be taken to remove the present risk.

Intelligence has come to hand of an underground explosion of gas in Hamilton to-day. It seems that an escape of gas was being searched for; but whether that was the occasion of the explosion or not, there are not sufficient particulars known to be able to say. There were six successive concussions; and from as many street-gratings, mud and water were sent about 30 feet into the air. That argues considerable force. Hamilton, as is well known, suffers very much from the underground workings for coal; and the general belief is that a subsidence arising from this cause fractured a gas-pipe, from which gas escaped into a sewer.

You will, of course, be giving in your "Legal Intelligence" a report of the proceedings before Mr. Justice North, with reference to the litigation relating to the North British Water-Gas Syndicate; and I merely mention it here to note that the Company having gained the point raised, and set aside the service of the writ, any further proceedings, if taken, will have to be in Scotland. It is probable that proceedings may be taken in this country; but their success would be very doubtful, as it is pretty well settled as the law here that the Bench will not interrupt, at the instigation of one or two, a policy which is approved by the general body of the shareholders. In the event of fraudulent misrepresentation, if that were proved, the sufferers by it might recover their personal losses from anyone whom they could hold guilty of the fraud. But that is not the case here; and if an action were raised in Scotland by a few shareholders, to compel the Directors to re-pay the whole capital of the Company, it would almost of a certainty go to the wall.

In Aberdeen, during the past year, the number of gas-meters which were tested amounted to 1246, from which £33 4s. of fees was derived. Of the whole, 1168 meters were tested for the Corporation; and the remaining 78 for persons who complained of their meters not working satisfactorily. Of the Corporation meters, 9·3 per cent. were found not to conform to the statute, and were not stamped. Of the others, 37·1 per cent. were found not to conform to the statute.

The great annual municipal turmoil in Scotland is over for another year. Very little change has been made in the representation of any of the large communities who manage their own gas supply; so it may be expected there will be that continuity of policy which is always to be desired. In Dundee, the Chamber of Commerce met yesterday and re-elected the five representatives they send to the Gas Commission. After their elections, Mr. R. O. Parker, one of the number, gave a rather rose-coloured account of the doings of the Gas Commission during the past year. His statement was of no value, and merely emphasizes the necessity there is for doing away with the method of outside representation which exists in Dundee.

The Dunoon Gaslight Company has been converted from a co-partnery into a limited liability Company, the registration of which was effected this week. No change has been made upon the nominal capital of the Company, which remains at £10,000, in 5000 shares of £2 each, fully paid up. The co-partnery which has thus been superseded dated from Jan. 17, 1852. The registered office of the Company is at the Gas-Works, Sandbank Road, Dunoon.

Sulphate of ammonia, which for several weeks has shown a downward tendency in the market, has revived, and is now selling at £12 15s. for immediate, and £13 for forward delivery.

Lockerbie is the only town in Scotland I am aware of where the gas contingent guarantee rate is in force. The Police Commissioners acquired the gas undertaking two or three years ago; and the price they paid (£5400) seems to be a heavy burden upon them, more especially as considerable repairs have been required upon the works. They have accordingly imposed a contingent guarantee rate of 5d. in the pound, which, considering that the place is small—having less than 3000 population—is felt by many of the residents to be a grievous imposition. A number of them appealed to the Commissioners against the rate; and this week they were heard in support of their appeals. The argument used was, of course, that it was unjust to impose a rate upon non-consumers of gas, in order that the Commissioners might be able to supply it to others at a less price. Morally, the argument is unanswerable, because it is unfair to non-consumers of gas to make them pay for other people's light. The Commissioners, however, seem to be unable to help themselves; and as they undoubtedly have the power to levy the rate, they exercised it, and dismissed the appeals. One of the appellants intimated that the question might be raised in a Court of Law. There is small chance of his succeeding there. It is, however, regrettable that the Commissioners cannot see their way to adopting another policy of finance, because the rate must, by making the use of gas unpopular, injuriously affect their revenue.

Lord Low, in the Court of Session, last week decided a point in a question relating to water supply, which may have ultimate consequences. There is at present an action before him, by the Falkirk and Larbert Water Trustees, against a proprietor of land adjoining the Trustees' reservoir at Earl's Burn and his fishing tenant, which has been brought to interdict the respondents from placing trout in the reservoir. In the discussion, the argument was used for the Trustees that, if the landlord, having the right to fish in the reservoir, were also entitled to stock it, he might allow the fish to multiply till the reservoir came to be stocked to a large extent with fish and not with water; and the storeage capacity would thereby be reduced. His Lordship took no notice of this argument; but seized hold of a statement by Counsel that the reservoir was not one for catchment purposes, but was used as a sort of cistern, and was in summer frequently run pretty far down. He said he could quite understand that in a dry year the water might get so low as not to be of sufficient quantity, nor of good enough quality, to sustain life; and that then the fish would die and putrify, than which he could not imagine a worse state of circumstances. He suggested that a statement to that effect should be put upon the record; and, the respondents not objecting, the amendment was made. He then allowed proof.

The Edinburgh and District Water Trustees have effected the renewal of £39,900 of mortgages falling due at this time; and have been able to reduce the rate of interest from 3¼ to 3 per cent., which means a saving of practically £100 a year to them. They have this week resolved to lay a new pipe from the distributing reservoir at Alnwickhill, to improve the supply of water to the higher portions of the city. The new main is to be of 24 inches diameter; and it is estimated to cost £10,500. It was reported that provision has already been made for the prospecting of the areas from which the additional water supply is to be selected. Bores are to be made at a number of places, to ascertain at what depth a solid foundation may be had for embankments; weirs are to be constructed upon the streams, for the gauging of the flow in them; rain-gauges are to be placed to measure the amount of the rainfall; and samples of the waters are to be taken at flood and ordinary times. The works are to proceed simultaneously at all the places.

The Price of Gas at Clitheroe.—The proposal on the part of the Gas Committee of the Clitheroe Corporation to increase the price of gas, was defeated at last Thursday's Council meeting. Those who advocated the advance did so because of the high price now charged for coal and cannel. The price of gas at present is 3s. 10d. per 1000 cubic feet; and this is considered by the majority of the Council to be quite enough. It was contended by some that the Council made a bad speculation when they purchased the old works some years ago.

The Oldham Gas and Water Undertakings.—Alderman Smith, the Chairman of the Gas Committee of the Oldham Corporation, was last Thursday elected Mayor of the borough. In returning thanks, he spoke of the work of the Corporation, more particularly in the gas and water departments. With regard to the gas-works, he remarked that they had an annual increase of about 5 per cent. in their business. At the Higginshaw works, they had a plant which was equal to that of any borough in the country. They had considerable storeage capacity for coal and cannel; and by the use of two steam-elevators they could stack 1000 tons a day with very few men. This was a double advantage, for they could deal expeditiously with coal as it arrived in irregular quantities in the winter, and they could purchase economically, because they could take the material in quantities to suit sellers. They had recently commenced the erection of a gas-holder which would have a capacity of 1,600,000 cubic feet; the excavations for the tank being done by workmen employed by the Gas Committee under the superintendence of the Gas Engineer (Mr. J. Chadwick). As to the water-works, the Council could congratulate themselves that these were not a burden upon the rates, and that they had passed through a period of remarkable drought without stinting the supply.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 11.

Sulphate of Ammonia.—There is a decided improvement; and both spot and forward deliveries are dearer. Inquiries for future contracts especially have been most active; and the business would have been larger but for the disinclination of many makers to anticipate the disposal of their production. As much as £13 is reported to have been paid for January-April delivery. As regards prompt lots, £12 12s. 6d. to £12 15s. is now the value; and, seeing the unprecedentedly small supplies for the time of the year, it would not be surprising to see a further advance before the end of the month. The nitrate position is once more brought to the front, as likely to have a deleterious effect upon sulphate values by-and-bye; and special attention is called to the fact that the October shipments exceed the estimates by about 50,000 tons. The following was, however, the position at the end of October:—

	1893 Tons.	1892 Tons.	1891 Tons.
Deliveries in October from European ports	46,000	36,000	37,000
Stocks at end of October	78,000	172,000	132,000
Afloat	270,000	215,000	249,000

LONDON, *Nov.* 11.

Tar Products.—There has been no striking feature in this market during the week. Benzol barely maintains its position; while creosote oil is quite ¼d. less in value, owing to the larger production. There is a little inquiry, and some small business has been done, in 60's carbolic acid at the price fixed by the Tar Products Committee. Solvent naphtha moves off freely, and maintains its price, with a good deal of inquiry. Toluol is said to be scarce; some makers having oversold themselves. Pitch continues firm; large shipments being made on contracts. Values obtaining during the week may be taken as: Tar, 15s. to 16s. Pitch, 26s. to 27s. Benzol, 50's, 1s. 7d.; 90's, 1s. 6d. Creosote, 2d. Creosote salts, 25s. Solvent naphtha, 1s. 2½d. Toluol, 1s. 8d. Crude benzol naphtha, 30 per cent., 8¼d. Carbolic acid, 60's, 1s. 7d.; crystals, 5¾d. Cresol, 1s. 2d. Anthracene, 30 per cent., "A," 1s. 2d.; "B," 10d.

Sulphate of Ammonia.—This market is undoubtedly stronger; and very considerable business is being done at prices ranging from £12 8s. 9d. to £12 12s. 6d., according to position, less 3½ per cent.; while for forward deliveries £12 15s. could readily be obtained. Gas liquor is offered at 7s. to 8s. 9d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—During the past week, there has been a greater scarcity of fuel of all descriptions than has been experienced since the stoppage commenced. Prior to and pending the negotiations going on in London with a view of effecting some settlement, there was almost a total cessation of further buying, in anticipation of some general resumption of work at the collieries. Therefore, when the settlement proposals collapsed, comparatively little or no coal had been ordered to come in from outside districts, whilst consumers had run down their stocks; and in the face of very small arrivals at the stations in the district, there was on all sides a pressure for immediate supplies. This necessarily had the effect of at once forcing up prices; and all sorts of figures were being asked. Representatives of collieries in outside districts promptly advanced their quotations 2s. and 3s. per ton, and in some cases 5s. per ton; whilst merchants and dealers who happened to have any supplies on hand, were readily getting advances of 7s. to 8s. per ton. All the leading Manchester colliery concerns have raised their wharf and delivery rates upon house coal 2s. 6d. per ton; and upon other descriptions of fuel, for general manufacturing requirements, 2s. to 2s. 6d. per ton. To a considerable extent, the advances which have been quoted during the past week are, of course, only temporary; and as deliveries of coal which has been ordered come to hand, the market will no doubt ease down to some extent. The further restarting of some of the Lancashire collieries may also have some effect upon prices. Delivered at stations in the neighbourhood of Manchester, Scotch house coal has been fetching 25s. to 27s.; Nottingham coal, about 26s. 6d.; Staffordshire coal, according to quality, from 25s. up to 28s. 6d.; whilst lower sorts of fuel have averaged about 19s. 6d. to 20s. for slack, and 23s. to 24s. per ton for steam coal, delivered at stations. The Lancashire collieries that are working have also hardened up in their prices. Engine fuel has been quoted at 16s. to 17s., and round coal at 21s. to 22s. per ton at the pit mouth, with very little offering even at these figures.

Northern Coal Trade.—The continuation of the strike in the Midlands has stiffened prices for coal in the North of England, and has again increased the demand. As the pits were working fully, this has been only partly met; but there is more coal here available now, the shipments showing a falling off to several foreign countries. Best Northumbrian coal is being largely sent to the Metropolis; and as high as 16s. 6d. per ton f.o.b. has been paid the last few days, while still higher prices have been asked. Second qualities are sold at about 15. to 15. 6d. per ton below best; and small steam coals are being sold freely for manufacturing purposes and command about 7s. per ton f.o.b. For all these kinds of fuel, the demand is only limited by the extent of the output and the ability to carry them promptly to the users. Gas coal finds an abundant inquiry; but so much of this is usually sold on contracts, that there is only a very limited quantity for sale. The uncontracted fuel finds keen purchasers; and small lots are obtaining high prices—as much as 12s. per ton having been paid for odd lots. This is just about double the price that sales took place at prior to the strike in the Midlands. Manufacturing coals are very steady; the demand from the Midlands being heavy and continuous. Coke is rather firmer, at about 16s. per ton; but at present the sale of the uncoked coal is more remunerative to the coal-owners. Gas coke is now in larger sale; and the demand is a little better, more being used for household purposes. There has been no alteration in the price of gas coke locally for a little time.

Scotch Coal Trade.—Prices have again hardened this week, consequent upon the failure of the conference in London. The demand for coal for the Midland districts of England is thought by some not to be quite so great as it was, on account of supplies having become procurable from places where the men have resumed work. There is, whether that be so or not, a feeling arising among manufacturers that more attention is being paid to outsiders than to home owners of works. The coalmaster, on the other hand, is anxious to send away as much coal as possible; and this week an important conference of owners and shippers was held in Edinburgh at which the railway and dock companies were urged to provide more loading berths. One speaker estimated that the loss at Methil alone, on account of want of loading berths, must for the past few months have amounted to £20,000. There is no dispute with the men in Scotland, except at the Lothian Coal Company's Newbattle pits, where the miners are still locked out because they will not accept an arrangement to work eleven days a fortnight. Neither side appears willing to yield. As regards prices, it may be said that they are not quotable, because of the different conditions under which sales are being effected. Prices are ruled largely by the time in which delivery is wanted. Taken all over, from 10s. 9d. to 11s. 6d. may be given as the current price for all descriptions. Shipments during the past week amounted to 218,717 tons—an increase upon the quantity in the preceding six days of 1512 tons, and upon the corresponding week of last year of 58,854 tons. Last week the figures for the year to date exceeded, for the first time, those of last year; and this week they are again up. The total since Jan. 1 has been 6,644,004 tons—an increase of 88,684 tons.

The Kendal Corporation and the Gas and Water Works.—The Corporation of Kendal and the shareholders of the Gas and Water Company met last Friday to consider the draft agreement for the acquisition of both concerns by the Corporation. The principal points in this document were given in the JOURNAL last week. The Corporation decided to purchase, with the consent of the ratepayers, the cost to be £80,000, with additional charges, making about £92,000. There is a further proposed expenditure of £25,000 to augment the water supply; making about £120,000 altogether.

The Derby Gas Consumers and the Increased Price of Gas.—In the JOURNAL last week a paragraph appeared to the effect that, owing to the increase in the price of gas at Derby, consequent upon the long continuance of the dispute in the coal trade, 800 meters had been disconnected. The action which the Directors of the Gas Company were reluctantly compelled to take led a number of consumers (chiefly small ones) to discontinue using gas, either by having the meters temporarily stopped or cut off; but we are pleased to learn that the number scarcely exceeds one-tenth of that reported. The bad state of trade, a commendable desire to avoid incurring debt, and misconception of how little the additional charge of 3d. per 1000 cubic feet would affect quarterly payments, no doubt influenced those who have (it is to be hoped only temporarily ceased) to be consumers of gas.

The Electric Lighting Scheme for Tunbridge Wells.—Last Thursday, Mr. Arnold Taylor, one of the Inspectors of the Local Government Board, held an inquiry at Tunbridge Wells relative to the proposal of the Corporation to borrow £13,000 for electric lighting. Mr. A. H. Preece, jun., gave evidence with regard to the plant proposed to be laid down; and, in reply to questions, he stated that an extended area could be lighted without further capital, as part of the buildings originally proposed would not be built for the present, and the money would be devoted to laying mains. The outlay would ultimately be brought up to £25,000. Mr. Strange (a member of the Council) submitted that, having a debt of £280,000, and impending liabilities for water supply, sewerage, &c., the town ought not to burden itself further, but allow a private company, under proper restrictions, to light the town. The Inspector, at the close of the evidence, visited the site for the central station.

The Bacup Corporation and the Rossendale Water-Works.—Last Wednesday the Bacup Corporation held a special meeting for the purpose of confirming the resolution passed at a previous meeting for the purchase of the undertaking of the Rossendale Water-Works Company. The terms arranged are that the Corporation shall pay 5 per cent. in perpetuity on the share capital of £26,794; the mortgage loans at 3¾ per cent. being paid off as they mature. The Council unanimously approved the purchase; but at a ratepayers' meeting held afterwards considerable opposition was raised, chiefly on the ground that the price to be paid was too high. On a vote being taken, the numbers were nearly equal; and on the Mayor declaring the resolution carried, one of the opponents demanded a poll. Considerable discussion followed; and in the end it was decided to take the opinion of the meeting as to whether or not there should be a poll of the ratepayers. It was resolved that it was undesirable to take one; and the opposition did not raise further objection.

The Local Government Board and the Wigan Gas Accounts.—Major-General Crozier, one of the Local Government Board Inspectors, held an inquiry last Friday, into an application by the Wigan Town Council to borrow £35,000 to cover expenditure that had been incurred over and above their borrowing powers. In the course of the proceedings, the Inspector said the accounts of the Gas undertaking had been a source of great trouble to the department; and it was a notorious fact that they had been kept in a most extraordinary manner. He himself had spent days poring over them; and it was really too much to stand. The accounts were very much mixed in consequence of the Corporation undertaking one part of the work themselves and getting contractors to do another part; and he advised them in future to get important constructive works carried out by contractors, instead of "pottering" about in the way they apparently had been doing. He did not doubt the accuracy of the accounts; but they were much involved. A great mistake the Wigan Corporation had made was in not applying for this money sooner. They had allowed long years to elapse before applying for borrowing powers sufficient for the purposes of their gas-works; and in future they must always keep at least six months in front of their requirements.

Berlin Water Supply.—The new water-works on the Maggelsee, near Friedrichshagen, have been put in operation, and are now supplying 20 million gallons of water daily to Berlin.

Spalding Water Supply.—Remarkable artesian springs, yielding 1,872,000 gallons per day at a pressure of 16 lbs. to the square inch, have been tapped in the oolitic beds at Bourne, Lincolnshire, at a depth of 100 feet from the surface, by means of an artesian tube well 13 inches in diameter, fixed by Messrs. C. Isler and Co., of London. The water is conveyed to the town by gravitation through pipes for a distance of ten miles. Droughts of past years have, it is stated, made no impression on the springs of the district, as several towns obtain their supply from the same source.

The Drighlington Gas Company and the Price of Gas at Tong.—A meeting of ratepayers and gas consumers was held at Tong on the 3rd inst., to consider a letter from the Drighlington Gas Company explaining the reasons for the advance of 3d. in the price of gas, of which the Directors had given notice. The communication was in reply to a resolution passed a few weeks ago, at a similar meeting, protesting against the increase. It was stated in the letter that the Directors had no intention of the advance being permanent; and a return to the old price would be made as soon as possible. There was no desire on their part to increase the profits at the expense of the consumers—rather the reverse. The slight advance would not at all compare with the extraordinary expenditure and loss through bad markets for residuals which the Company had been experiencing for some time past. In the course of a discussion which took place, an opinion was expressed that the letter was satisfactory as far as it went; but, considering the large amount of distress existing in this mining district, and the dividends which the Company had been able to pay in the past, it was thought that the rise was unreasonable. Resolutions were passed appointing a deputation to wait upon the Directors to discuss the matter, and asking the Local Board to support them in the way which they considered most suitable. Last Wednesday, the Board resolved that a deputation should confer with representatives of the Drighlington and Gildersome Boards, with a view of approaching the Company.

The Reinstatement of Footpaths after Repairs to Pipes.—A dispute which has been pending for several months between the Consett Local Board and the Shotley Bridge and Consett District Gas Company has just been decided. The dispute arose under the following circumstances: A gas explosion occurred at Consett on the 11th of January last; and, in searching for the leak, the Gas Company had to cut open certain trenches in a cement footpath under which the pipes were laid. After completing their investigation, the Local Board's Surveyor requested the Company to put down a new footpath 70 feet by 18 feet, as the trenches, which were only 18 inches wide, had spoiled the appearance of the footpath, and the explosion had cracked and shaken it. The Company denied this, and reinstated the trenches by cement filling. This led to an official order from the Board that the whole footpath must be taken up and relaid, the cost of which would be about £20. The Company offered to refer the question to an impartial referee; and this was agreed upon. Mr. C. P. Douglas, of the Consett Iron Company, was chosen; and, after hearing the case, he gave his decision. In the course of it, he said that, after hearing the evidence, and inspecting, with Mr. J. Collinson and Mr. W. Rippon, representing the Local Board, and Mr. J. W. Rounthwaite and Mr. M. Richley (Secretary), on behalf of the Company, the footpath complained of, assuming that the Company had the power to break into the cement for the purpose of making branch connections to houses and shops, he considered that they had properly repaired any damage caused by the explosion of gas, but that the trenches cut for laying in service-pipes should be more evenly cemented over—avoiding any cracks or partings. After hearing this decision, the members of the Board agreed to let the matter drop.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 888.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	13 Oct.	10½	Alliance & Dublin 10 p. c.	10	16½—17½	..	6 0 0
100,000	10	,,	7½	Do. 7 p. c.	10	11½—12½	..	6 0 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	102—104	..	4 16 2
100,000	20	31 May	8	Bahia, Limited	20	10½—11½	..	13 18 3
200,000	5	12 May	6½	Bombay, Limited	5	5½—6	..	5 8 4
40,000	5	,,	6½	Do. New	4	3¾—4¼	..	5 13 0
380,000	Stck.	16 Aug.	11½	Brentford Consolidated	100	220—225	..	5 2 2
180,000	,,	,,	8½	Do. New	100	163—168	..	5 1 2
220,000	20	15 Sept	11½	Brighton & Hove Original	20	40—42	..	5 9 6
888,500	Stck.	31 Aug.	5	Bristol	100	102—105	..	4 15 3
320,000	20	29 Sept.	11¼	British	20	42—44	..	5 4 7
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	15—16	..	5 6 3
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	6—7	..	2 17 2
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	97—100	..	6 0 0
150,000	20	13 July	8	Cagliari, Limited	20	26½—27½	..	5 16 4
550,000	Stck.	13 Oct.	12½	Commercial, Old Stock	100	244—249	..	5 0 4
165,000	,,	,,	9½	Do. New do.	100	187—192	..	4 19 0
160,762	,,	15 June	4½	Do. 4½ p. c. Deb. do.	100	125—130	..	3 9 3
800,000	Stck.	15 June	13	Continental Union, Limited	100	230—235	..	5 10 7
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	191—196	..	5 2 0
75,000	Stck.	15 Sept.	10	Crystal Palace District	100	285—290	..	5 5 3
486,090	10	28 July	10	European, Limited	10	21—22	..	4 10 11
354,060	10	,,	10	Do. Partly paid	7½	14½—15½	..	4 17 0
5,646,590	Stck.	16 Aug.	12	Gaslight & Coke, A, Ordinary	100	220—225	..	5 6 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	97—102	..	3 18 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	263—268	..	3 14 7
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	120—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	185—190	+2	3 18 11
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	173—178	..	3 18 7
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	263—268	..	3 14 7
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	157—162	..	3 14 1
1,061,150	,,	15 June	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	132—137	..	3 5 8
908,000	,,	,,	6	Do. 6 p. c. do	100	175—180	..	3 6 8
3,800,000	Stck.	12 May	12	Imperial Continental	100	218—223	—4	5 7 7
75,000	5	15 June	6	Malta & Mediterranean, Ltd.	5	5—5½	..	5 9 1
560,000	100	2 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	105—107	+1	4 13 5
541,920	20	15 June	5	Monte Video, Limited	20	12½—13½	..	7 8 2
150,000	5	31 May	10	Oriental, Limited	5	7¼—7¾	..	6 9 0
60,000	5	29 Sept.	7	Ottoman, Limited	5	4—4½	..	7 15 6
166,870	10	—	2	Pará Limited	10	1½—2	..	—
420,000	100	2 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.	100	98—102	..	5 17 8
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
150,000	10	13 Oct.	5	San Paulo, Limited	10	8½—9½	..	5 5 3
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	302—307	—2	5 0 11
1,350,000	,,	,,	12	Do. B do.	100	243—248	—5	4 16 10
260,000	,,	,,	13	Do. C do.	100	258—263	..	4 18 9
750,000	,,	13 July	5	Do. 5 p. c. Deb. Stk.	100	148—152	..	3 5 9
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	210—215	..	5 7 0
				WATER COMPANIES.				
744,897	Stck.	29 June	10	Chelsea, Ordinary	100	270—275	..	3 12 0
1,720,252	Stck.	13 Oct.	8	East London, Ordinary	100	212—217	—2	3 13 8
544,440	,,	29 June	4½	Do. 4½ p. c. Deb. Stk.	100	140—145	..	3 2 11
700,000	50	15 June	8½	Grand Junction	50	113—117	—1	3 12 6
708,000	Stck.	16 Aug.	11	Kent	100	284—289	..	3 16 1
1,043,800	100	29 June	9½	Lambeth, 10 p. c. max.	100	244—248	—1½	3 16 7
406,200	100	,,	7½	Do. 7½ p. c. max.	100	199—204	..	3 13 6
310,000	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	128—131	..	3 1 0
500,000	100	16 Aug.	12½	New River, New Shares	100	335—340	..	3 11 4
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	132—135	..	2 19 3
902,300	Stck.	15 June	6	S'thwk & V'xhall, 10 p. c. max.	100	155—160	..	3 15 0
126,500	100	,,	6	Do. D 7½ p. c. do.	100	145—150	..	4 0 0
1,155,066	Stck.	15 June	10	West Middlesex	100	262—267	..	3 14 10

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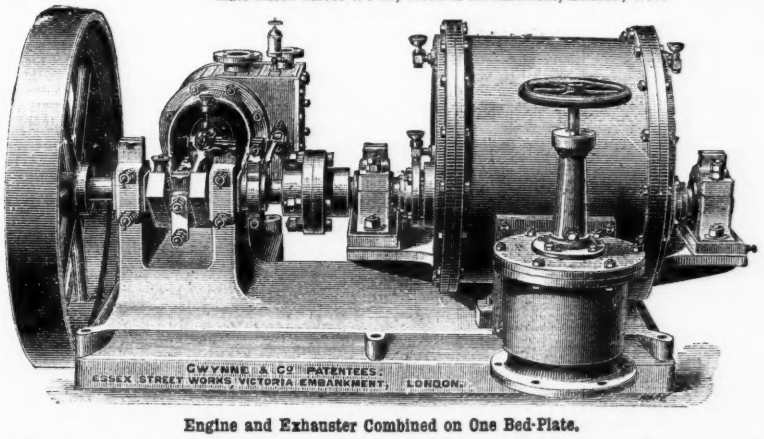

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WANTED, by the Son of a Gas Manager, a Situation on a Gas-Works as METER INSPECTOR or MAIN and SERVICE LAYER. Has a good knowledge of the general routine of a Gas-Works. Age 24 years.
Address the MANAGER, Water and Gas Company, BENHILL.

WANTED, by the Advertiser (aged 29, and total abstainer), a Situation on a Gas-Works as ASSISTANT to Engineer or Manager, or Bookkeeper. Six years in present Situation. Speaks Portuguese thoroughly. No objection to go abroad. Will be disengaged by end of January, 1894. Good references.
Address No. 2293, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS ENGINEERS AND MANAGERS.

ADVERTISER desires a Situation as WORKING FOREMAN. Has had considerable experience in Constructing, Erecting, and Supervision; and thoroughly understands the routine of Gas-Works throughout. Has acquired thorough knowledge of the most modern methods in Carbonizing, Gas Purification, and Distribution.
References and testimonials forwarded on application, by letter, to No. 2300, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ST. AUSTELL GAS-WORKS.

WANTED, a Man who thoroughly understands the making of Gas, Sulphate of Ammonia, and the General Management of a Gas-Works, as MANAGER of the above Works. The Manager would have to keep the Accounts, and collect the Gas and Meter Rents. House, Gas, Fuel, and Rates and Taxes provided and paid by the Company.
Applications, stating experience and former occupation, with salary required, to be sent to R. G. LAKES, Esq., Trevarrick, St. Austell, CORNWALL, on or before Saturday, Dec. 2 next.
Nov. 1, 1893.

TO BE SOLD—A Station Meter, in Good Working Condition, with Clock, Tell-Tale, Bye-Pass Valve, 6-inch Connections, and two Cup Valves, at the Elsecar Gas-Works, Barnsley. Price £40 net.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield; AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. IV., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

LIQUOR, Tar, and Spent Oxide wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS, DESIGNS, AND TRADE MARKS.

INVENTIONS Protected by Letters Patent. TRADE MARKS REGISTERED at home and abroad. Advice on all questions relating to above. Handbook gratis.
Apply to J. C. CHAPMAN, Chartered Patent Agent, 70, Chancery Lane, LONDON.

THE Madeley Coal and Iron Company, Limited, Madeley, near Newcastle, North Staffordshire, have some GAS COALS to sell. Prompt delivery.
Telegraphic Address: "SETTLE, MADELEY, STAFFS."
Agents South of Stafford: MESSRS. J. HACKETT & CO., LEAMINGTON.

BRADFORD CORPORATION WATER-WORKS.

TO CONTRACTORS.

CONTRACT NO. 2.—NIDD AQUEDUCT.

THE Corporation of Bradford invite TENDERS for the CONSTRUCTION and MAINTENANCE for Twelve Months after Completion of a MAIN AQUEDUCT from the River Nidd to Chellow Heights, Bradford, a distance of 31½ miles or thereabouts; BRANCH AQUEDUCTS extending to 5¾ miles or thereabouts in length, situate at various places on the line of the Works; also DAMS, INTAKES, WEIRS, BRIDGES, CHAMBERS, and other collateral Works.

The Works will comprise:—
1—5¾ Miles of Main Aqueduct in Tunnel.
2—11¾ Miles of Main Aqueduct in Cut-and-Cover.
3—14 Miles of Main Aqueduct Trenches, and Laying and Jointing Cast-Iron and Steel Pipes, 36 inches diameter.
4—5¾ Miles of Branch Aqueducts and Pipe-Lines 30 inches to 6 inches diameter.
5—Masonry, Dams, and Weirs at various Streams.
6—Bridges over the River Wharfe, Leeds and Liverpool Canal, River Aire, and other Streams.
7—Culvert under the Midland Railway, and Steel Girder Bridge near Bolton Abbey Station.
8—Measuring, Air, Scour, and other Chambers.

The Work is scheduled in six sections; and the Corporation reserve the power to let each section to separate Contractors, or to let a number of such sections, or the whole to one Contractor, and Contractors may tender for any one or more of the sections, or for them all.

The Drawings and Specification of Works may be seen, and copy of the Specification, with Conditions, Bill of Quantities, and Form of Tender, including outline Plan and Section, and reduced Drawings of the more important parts of the Work, may be obtained at the Office of Mr. James Watson, M.Inst.C.E., the Corporation Water-Works Engineer, Town Hall, Bradford, on and after Monday, the 13th inst., on payment of Five Guineas, which sum will be returned in full as soon as practicable after the receipt of a *bonâ-fide* Tender with the Bill of Quantities and Schedule fully priced out, accompanied by the Specification and Drawings attached.

An Assistant Engineer will meet intending Contractors at Fateley Bridge Station on Thursday, the 16th inst., Tuesday, the 28th inst., Wednesday, the 6th of December, and Thursday, the 14th of December next, at Ten a.m. each day, to show them over the site of the Works.

Sealed tenders, endorsed "Tender for Nidd Aqueduct," to be sent to the Town Clerk, at the under-named Office, not later than Friday, the 22nd of December next.

An assurance must be given by each Contractor that he pays to the workmen employed by him not less than the minimum standard rate of wages.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
W. T. M'GOWEN,
Town Clerk.

Town Clerk's Office, Town Hall, Bradford,
Nov. 8, 1893.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore, Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

Gas and Water Stocks and Shares in the following Companies:—
Barnet District Gas and Water Company,
Harwich Gas Company,
Enfield Gas Company,
Waltham Abbey and Cheshunt Gas Company,
Colney Hatch Gas Company,
Walton-on-Thames and Weybridge Gas Company,
Lea Bridge District Gas Company, and the
Woking Gas Company.

MR. ALFRED RICHARDS will sell the above BY AUCTION, at the MART, E.C., on Tuesday, Nov. 21, at Two o'clock, in lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

LEA BRIDGE DISTRICT GAS COMPANY.

BY ORDER OF THE DIRECTORS.

Sale of £00 £10 Shares, part of the further additional Share Capital authorized by the Lea Bridge Gas Act, 1878, and ranking for a Dividend of 7 per cent. per annum, with increase or decrease under the usual Parliamentary Sliding-Scale Clauses.

MR. ALFRED RICHARDS will sell the above BY AUCTION at the Mart, E.C., on Wednesday, Dec. 6, 1893, at One for Two precisely, in lots.

Particulars may be obtained at the COMPANY'S OFFICES, 3, Jeffrey's Square, ST. MARY AXE, E.C., and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is hereby given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, on Tuesday, the 7th inst.,

Sir JULIAN GOLDSMID, Bart., M.P., in the chair, when the following Resolutions were unanimously passed:—

"That the Report of the Directors upon the affairs of the Association be received, adopted, and entered upon the Minutes.

"That a Dividend of 5 per cent. for the Half Year ended the 30th of June last, and a Bonus of 1 per cent., be declared upon the £3,800,000 Capital Stock of the Association, and that the same be payable, free of Income-Tax, on and after the 1st of December next.

"That the cordial thanks of the Meeting be given to the Directors for their able management of the affairs of the Association, to the Chairman for his conduct in the Chair this day, to the Secretary and the London Staff, and to Mr. H. V. Lindon, the Agents, Engineers, and other Officers of the Association on the Continent."

By order of the Board,
R. S. GARDINER,
Secretary.

21, Austin Friars, London, E.C.,
Nov. 8, 1893.

Now Ready, Cloth Bound, Price 3s. 6d., Post Free,

THE ROYAL COMMISSION on the METROPOLITAN WATER SUPPLY.

— 1892-3. —

Report of the Evidence (reprinted from the JOURNAL), with Comments on the Inquiry, and the Commissioners' Conclusions and Recommendations.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

G. L. LAMBERT, 26, Alberta Terrace, Nottingham. Consultations, Advice, Reports in Various Branches of **Practical** Mechanical Engineering and Machinery. **Specialities** in Water, Sewage, and Gas Plant Making. **Surveyor** of Steam-Ships, Marine Engines, Boilers, and General Machinery. **Detailed Inspection** of Engineering Contracts during Manufacturing and Erection.

EAST LONDON WATER-WORKS COMPANY.

ISSUE OF NEW CAPITAL.

NOTICE is hereby given, that the Directors are prepared to receive TENDERS for £35,000, being the sixth and final portion of the NEW PERPETUAL DEBENTURE STOCK of the Company, to bear Interest at 4½ per cent. per annum, free of Income-Tax, such Tenders to be delivered at the Company's Offices, St. Helen's Place, in the City of London, not later than Eleven o'clock, a.m., on the 14th day of December, 1893, and payment of accepted Tenders made on the 22nd of December.

Particulars and Conditions, together with Form of Tender, may be obtained at the said Offices, or will be forwarded on application.

By order of the Court of Directors,
ISAAC ADOLPHUS CROOKENDEN,
Secretary.

St. Helen's Place, London,
Nov. 4, 1893.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

(INCORPORATED BY ACT OF PARLIAMENT.)

SALE OF SEVEN PER CENT. STOCK.

MESSRS. G. A. WILKINSON & SON (in conjunction with Messrs. Wilkinson, Son, and Welch, of Brighton) are instructed by the Directors of the Brighton and Hove General Gas Company to SELL BY AUCTION, at the Mart, Tokenhouse Yard, City, on Wednesday, Nov. 22, at Two precisely, £20,000 SEVEN PER CENT. "A" ORDINARY CONSOLIDATED STOCK of the above Company, in 200 Lots, being £100 Stock in each Lot. The Sale is made under the provisions of the Company's Act of 1893.

Particulars and Conditions of Sale, with a copy of the audited Accounts for 1892, may be had at the Company's Offices, 5, Great Winchester Street, Old Broad Street, LONDON, E.C., and 77, West Street, BRIGHTON; of Messrs. HOWLETT AND CLARKE, Solicitors, 8, Ship Street, BRIGHTON; of Mr. RALPH HOMAN, Stock and Share Broker, 2, Austin Friars, LONDON, E.C.; of Messrs. WILKINSON, SON, AND WELCH, Auctioneers, 168, North Street, BRIGHTON; of Messrs. G. A. WILKINSON AND SON, Land Agents and Auctioneers, 7, Poultry, LONDON, E.C.

W. H. HARDY, Secretary.

Now Ready, Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS,

By

NORTON H. HUMPHRYS, Assoc. M.Inst.C.E., F.C.S.

This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas Making; Destructive Distillation; Condensation; and Purification.

LONDON:

WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

Now Ready, Price 15s., Limp Cloth, the Thirteenth Yearly

ANALYSIS OF THE ACCOUNTS OF THE Metropolitan Water Companies,

helsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the year ended December 31, 1892, or March 31, 1893, together with the quantity of Water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the year ended December 31, 1892.

Compiled and arranged by

ALFRED LASS, F.C.A.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

Price 2s. per dozen, or 10s. 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works

(also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

NIDDRIE CANNEL

A FIRST-CLASS CANNEL COAL,

Yielding a large volume of rich Gas, and fully 60 per cent. of first-class Coke.

FOR ANALYSIS, PRICE, AND ALL OTHER PARTICULARS, APPLY TO

The Niddrie & Benhar Coal Co., Ltd.,
15, HANOVER STREET, EDINBURGH.

Telegrams: "BENHAR, Edinburgh."

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 Candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

Shipments Promptly and Carefully Executed.

HUNTER'S

OXIDE OF IRON.

James Hunter, Lessee, Miner, and Shipper of NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed

Samples and Prices on application.

11, BAY STREET, PORT GLASGOW.

Telegrams: "Hunter Port Glasgow."

Established 1872.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.,

Output about 3000 tons per day.

Analysis—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,
Fitter.

HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-ON-TYNE.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

THOMAS TURTON AND SONS, Limited,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS

SCREW STOCKS, TAPS AND DIES,

SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES,

AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

ROBERT MARSHALL,

CANNEL COAL MERCHANT

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

THORNLEY GAS COALS

Worked by the

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[copy.]

Tudhoe and Sunderland Bridge Gas Company.
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

Gentlemen,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13¾ cwt.

Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**

The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. Cowan,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

G. WALLER & Co.'s NEW PATENT GAS EXHAUSTER

MADE WITH FOUR BLADES,

To pass 300,000 Cubic Feet per Hour, with or without Engine combined.

IN USE AND ON ORDER FOR OVER 100 WORKS,

AND EQUAL TO

5,340,000 CUBIC FEET PER HOUR.

SPECIAL ADVANTAGES:—

The Four-Blade Exhauster **PASSES 50 PER CENT. MORE PER REVOLUTION** than any One or Two Blade Exhauster.
It takes 27 per cent. less power than any Two-Blade Exhauster.
It gives a steadier Gauge than any other Exhauster.
One of our 150,000 feet per hour Patent Four-Blade Exhausters passes continuously **180,000** cubic feet per hour, driven by a **12-INCH STEAM CYLINDER.** No other Maker can give a similar result.
Model of Patent Exhauster sent for inspection.
Oldest Makers of Beale Exhausters for over 300 Works.
Patent Compensating Steam Governor, Special Tar and Liquor Pumps, Gas-Valves.
Washer-Scrubbers, with **WOOD CLUSTERS,** and Tar Extractor combined.

PHŒNIX ENGINEERING WORKS,

PARK STREET, SOUTHWARK, LONDON, S.E.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.
B Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY

Strongly recommended where EXCESSIVE HEATS have to be maintained.

AUG. KLÖNNE,

DORTMUND (GERMANY).

REGENERATIVE FURNACES.

Unsurpassed in Efficiency, Economy, Durability, and Easy Working.

To effect a great saving in

GAS-FURNACES use our Special Derbyshire **GANNISTER BRICKS.**

ADDRESS

JAMES WHITE & Co., Limited,
ALBERT WORKS, WIDNES.

RECIPROCO TRADE MARK REGISTERED

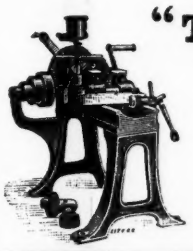
John Cowley & Son

PRIZE AWARDED CLASS 22

MANUFACTURERS OF

SCREWING MACHINES AND GENERAL TOOLS FOR ENGINEERS AND GAS-FITTERS.

SOLE LICENSEES AND MANUFACTURERS OF



"TURNER'S" PATENT TAPPING APPARATUS

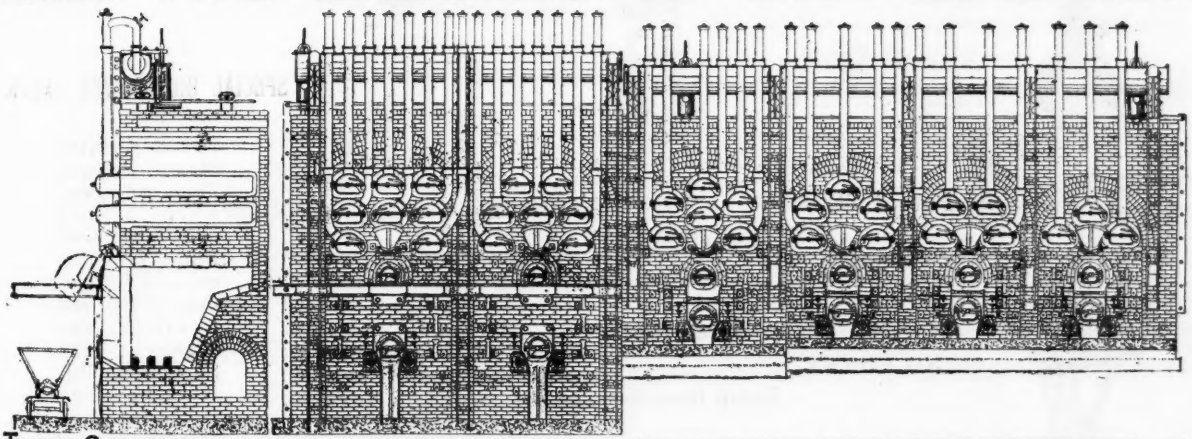
FOR DRILLING AND TAPPING GAS, WATER, OR OTHER MAINS UNDER PRESSURE.

ILLUSTRATED LIST ON APPLICATION.

CLARENDON STREET,
HYDE, near Manchester.

TELEGRAPHIC ADDRESS: "COWLEY, HYDE." TELEGRAPH CODE: "A B C, 4TH EDITION."

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE ADAPTED TO THE REQUIREMENTS OF ALL GAS COMPANIES AND GAS CORPORATIONS, AND HAVE ALREADY BEEN EXTENSIVELY ADOPTED. THEY ARE ERECTED UPON BOTH THE WORKING-STAGE AND SHALLOW-CHAMBER SYSTEMS, AND EQUALLY SATISFACTORY RESULTS ARE GUARANTEED IN BOTH CASES.

THE SETTINGS HAVE ATTAINED TO A MEASURE OF SUCCESS AND POPULARITY QUITE UNEQUALLED BY THAT OF ANY OTHER WITHIN THE SAME SPACE OF TIME. THE WORKING RESULTS OBTAINED, AND THE GENERAL SATISFACTION GIVEN, ARE DECLARED IN EVERY CASE TO EXCEED, AND IN MOST CASES CONSIDERABLY EXCEED, THE PATENTEE'S GUARANTEE. THE CONSTRUCTION AND WORKING OF THE PATENT PRODUCER AND THE PATENT CHARGING APPARATUS FOR SAME ARE ABSOLUTELY UNIQUE AND UNRIVALLED, AND ARE THE DELIGHT OF EVERY STOKER; WHILE IN EVERY OTHER PARTICULAR THEY SECURE THE HIGHEST RESULTS ATTAINABLE BY ANY REGENERATIVE SYSTEM, AND AT A MINIMUM OF COST.

Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings, or complete erection undertaken if required, and carried out by specially Trained Workmen.

Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stewart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge, and from R. F. HISLOP (son of Patentee), Gas-Works, Paisley.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine quâ non* TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED, AND AFFORDING THE HIGHEST SATISFACTION.

SPENT LIMES NO LONGER WASTE PRODUCTS

Under G. R. HISLOP'S PATENTS.

All Spent Limes are most effectually, economically, and continuously recovered at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it.

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Gas Lamps and Posts.

Patent Street Lamps.

NO PUTTY.

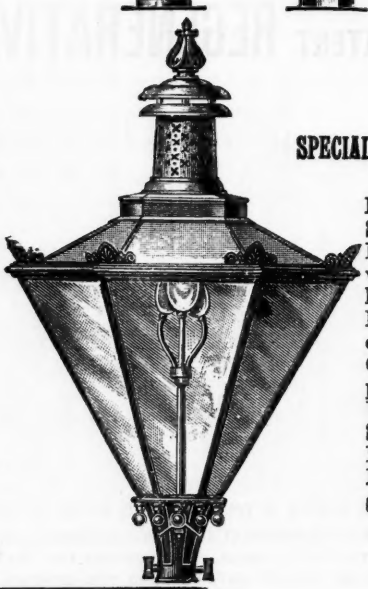
Several thousands of these are now in use, giving general satisfaction. They are strongly made, and of best material.

Lamplighters' Torches.

Lever Taps.

Lamp Governors.

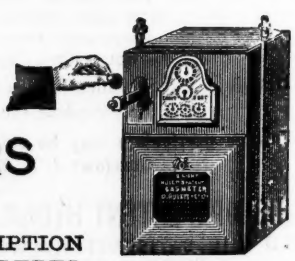
PRICE LIST ON APPLICATION.



SPECIAL HIGH-POWER LAMPS.

For Lighting Streets, Refuges, Promenades, &c., where a good light is required. Fitted with Porcelain cone, Copper top and perforation, Wrought-Iron Spray, Lever Tap, Burner and Patent Governor, glazed with Opal top.

GAS-METERS.



PREPAYMENT METERS

(PRICE'S PATENT)

SPECIALLY ADAPTED FOR INCREASING CONSUMPTION AMONG SMALL CONSUMERS. NO RISK OF BAD DEBTS.

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HEATHCOTE GAS COAL.

RICH IN ILLUMINATING POWER AND YIELD OF GAS.
ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.
MAINTAINS A HIGH STANDARD IN RESIDUALS.

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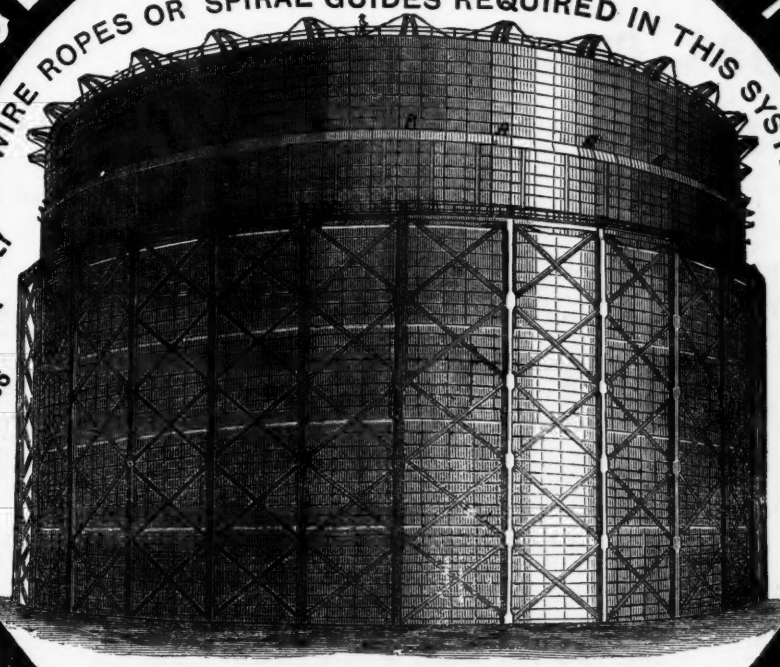
THE LARGEST GASHOLDER IN THE WORLD.

GASHOLDERS OUR SPECIALITY

NO WIRE ROPES OR SPIRAL GUIDES REQUIRED IN THIS SYSTEM.



INFINITELY SAFER AND FAR LESS COSTLY THAN ROPES OR SPIRAL GUIDES.

CAPACITY 12 MILLION CUBIC FT.

ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company
IT HAS SIX LIFTS 30 FT DEEP EACH AND IS 300 FT DIAR

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The United Gas Improvement Company, U.S.A.

A. G. GLASGOW, M.E.,
Late General Inspector,
The United Gas Improvement Company, U.S.A.

HUMPHREYS & GLASGOW,

Contracting Engineers for Water Gas Plant,
9, Victoria Street, London, S.W.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,
WORTLEY FIRE-CLAY WORKS
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

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GODDARD, MASSEY, & WARNER'S
IMPROVED
Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

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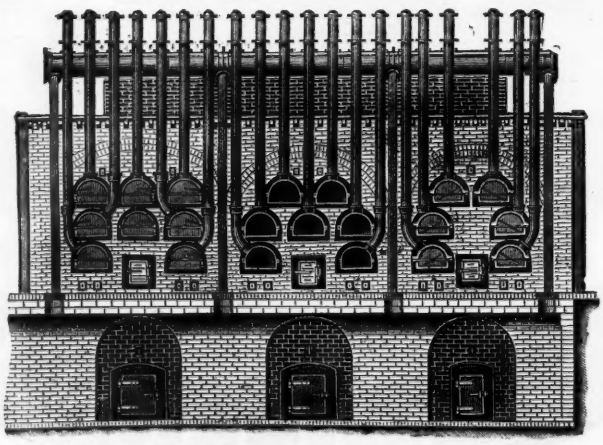
BUILDERS AND ERECTORS OF EVERY DESCRIPTION OF OVENS, BENCHES, KILNS, FURNACES, &c.



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ETC., ETC.

REGENERATOR AND GENERATOR FURNACES ON DRAKE'S, FRITH'S, SIEMENS'S, KLONNE'S, HASSE'S, VALON'S, SOMERVILLE'S, PONSARD'S and other Principles.

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Makers of every kind of Gas Apparatus and Structural Ironwork.

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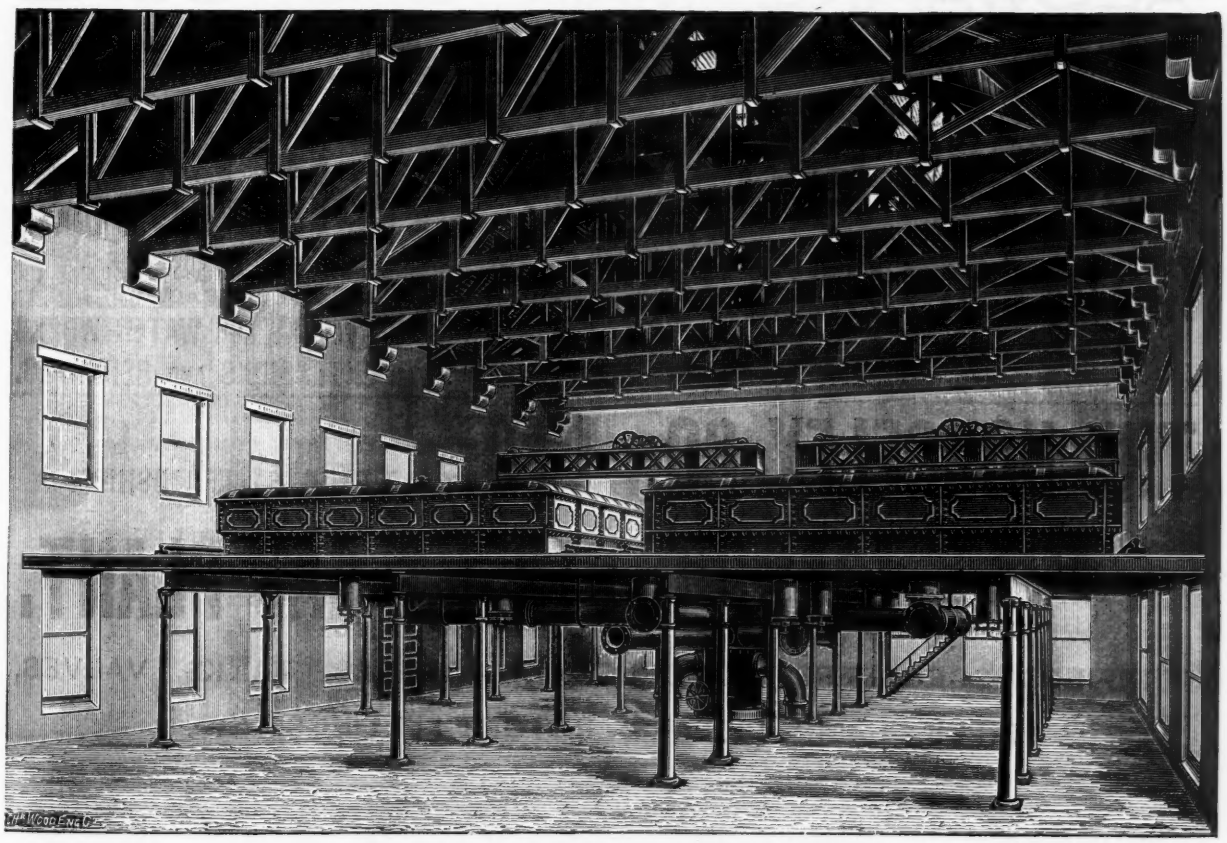

Illustration of four 30 feet square Purifiers, with 24-inch Centre-Valve, Connections, Wood Grids, Covers, Lifting and Travelling Cranes, Oxide Elevators, and special discharging arrangements.

STAGE FLOORS. ROOFS. CONVEYORS.

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Telegraphic Address: "SCRUBBER MANCHESTER."

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ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
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FOR LARGE OR SMALL
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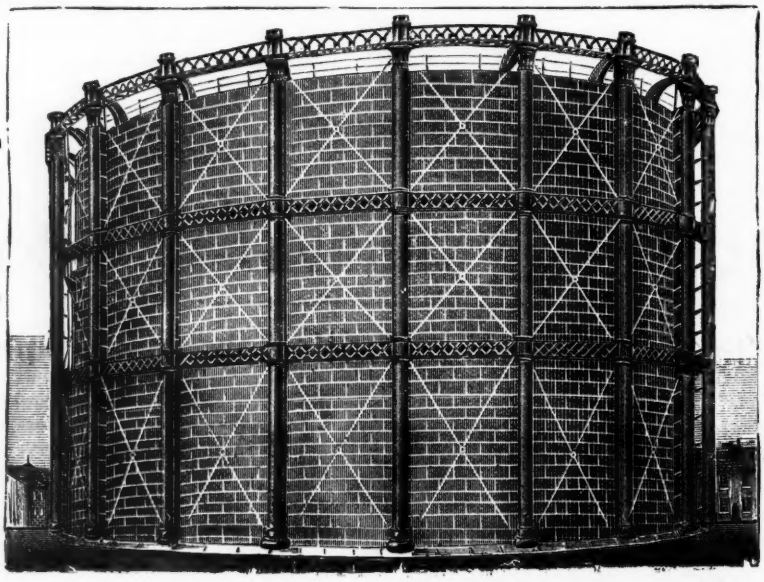

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"VERTMARCHE"

A 280-CANDLE POWER PLAIN IRON LAMP,

CLASS A— 55/-

LIGHT for LIGHT less than half the price of any other Regenerative Lamp.

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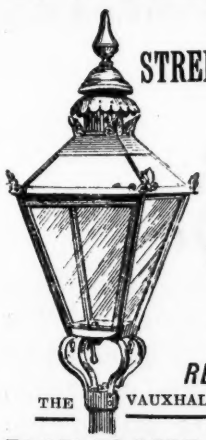
STREET LAMPS for HOME & EXPORT.



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IMPROVED STREET-LAMP REGULATORS AND LAMP TAPS.

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FLAT-FLAME GOVERNOR BURNERS,

Suitable for FACTORIES, OFFICES, and all Open Lights.

at 12/- per dozen.

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COLUMNS for GAS or ELECTRIC LIGHTING.

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Patent Automatic Machinery

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See Illustrated Advertisement, p. II. Centre of JOURNAL for Nov. 7.

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Gas-Bags for Mains. High-Water Boots. Woollen Miners' Jackets.

Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpauling Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber. Stokers' Gloves, 14s. per dozen.

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RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

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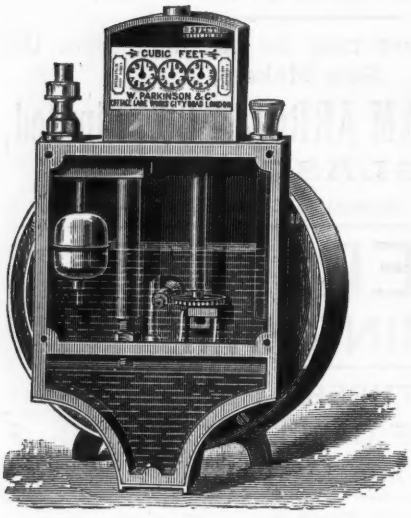
OLDEST ESTABLISHED FIRM IN THE TRADE.



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IN CAST-IRON CASES.

Work with very little friction. Will stand very high pressures. Cannot possibly be shut off by sudden increase of pressure, the Float being affected by Outlet Gas only. Allow for loss of water by evaporation without materially affecting the registration or shutting off the gas. Unexcelled for simplicity of construction, excellence of workmanship, or accuracy in registration.

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IN TINNED OR CAST-IRON CASES.

The Slow-Spoon Compensator has been in extensive use for many years; it maintains an unvarying water-line without appreciable friction, and provides a large reserve of water. The Float arrangement allows sudden or excessive pressure on the Inlet without affecting the working of the Meter or extinguishing the Lights.

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These Meters are unsurpassed for accuracy of registration. The cases are made of the best Charcoal Tin Plates; and each part of the Meter is stamped by special Machinery to ensure uniformity and exactness in construction. The Diaphragms are all of the best Persian Sheep Skins, carefully selected and the brasswork and smaller fittings are of superior workmanship.

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Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

10, MAWSON'S CHAMBERS, DEANSGATE,
MANCHESTER.
Telegraphic Address: "PRECISION."
[See also Advt. p. 882.

London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Nov. 14, 1893.